DECEMBER, 1946

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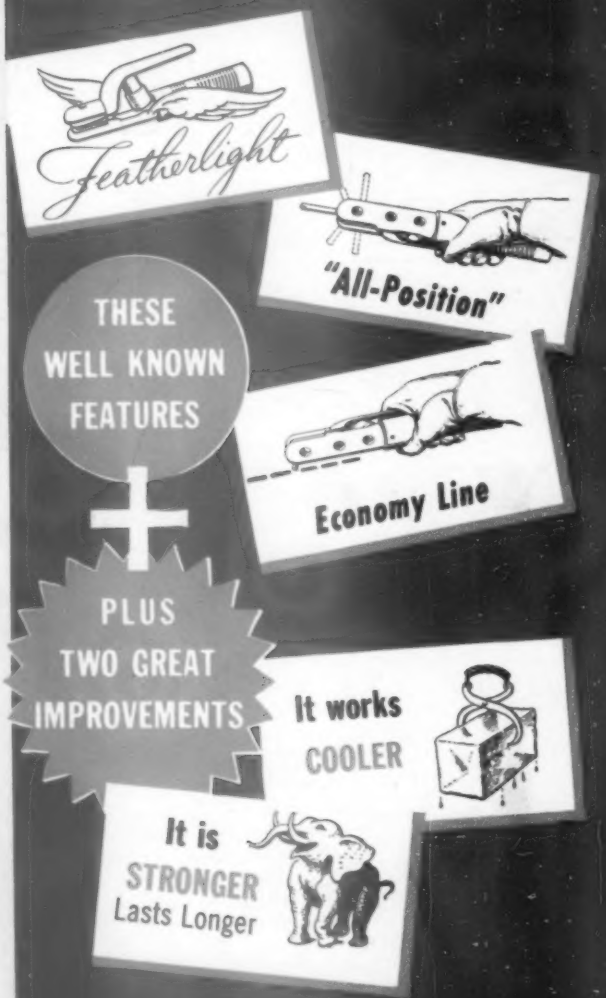

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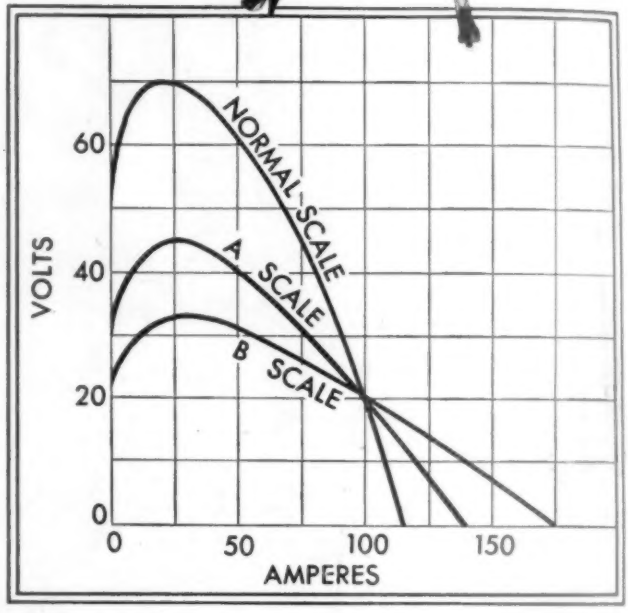

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THE WELDING ENGINEER

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Volume 31 • Number 12 **DECEMBER, 1946**

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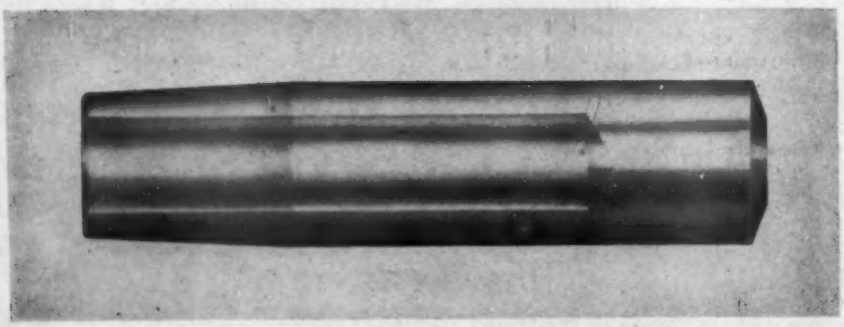

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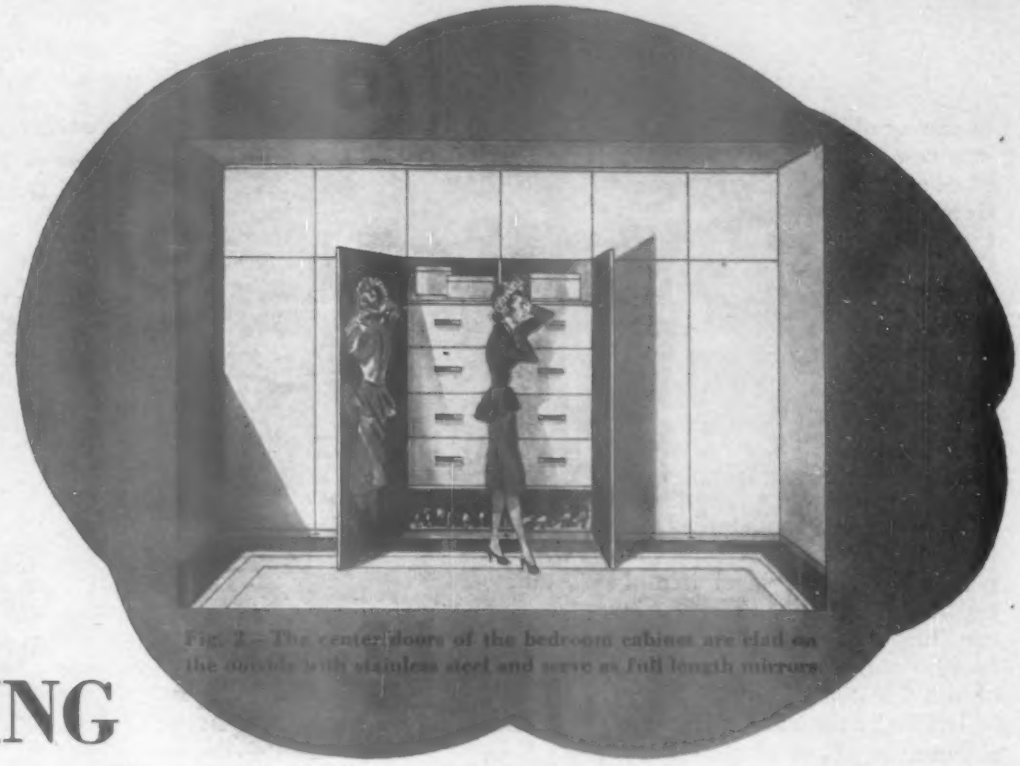


Fig. 2—The center doors of the bedroom cabinet are clad on the outside with stainless steel and serve as full length mirrors.

WELDING IN THE HOME

Steel cabinets for bedroom, basement and kitchen, enameled steel shower stalls, stainless-steel wash basins and toilets, prefabricated steel staircases, steel tiles and panels, steel structural members . . . these are some of the opportunities which new home construction offers

BY C. F. BLOCK
Industry Consultant,
Carnegie-Illinois Steel Corp.

THE NEED for tremendous numbers of new homes in this country is unquestioned. Every home building company or agency in this industry is exerting every effort to expand its activities. A great volume of welding will be required to assemble the equipment needed in these homes because steel will play a large part in its manufacture. Many of the houses themselves may also be fabricated from welded steel sections.

In the past many house parts have already felt the magic touch of welding. Such examples as steel casement windows, steel kitchen cabinets, stools, tables, kitchen and bathroom sinks and bathtubs illustrate the varied applications.

Many new welded parts have been planned for the future American home. One of these is an all-steel bedroom cabinet, Fig. 1.*

Extending from floor to ceiling across the entire wall, this type of cabinet will eliminate the necessity for outmoded dressers and chiffoniers and will provide space for the vanities or chaises longues which our wives have yearned for but could not use because of space limitations.

As the illustration shows, a cabinet of this type will contain removable trays for shoes, drawers for personal linen and lingerie, shelves for hats, blankets, pillows and other bedroom articles, separate closets for clothes. When all of these are in place and the cabinet doors are closed, the bedroom will have that tidy appearance that is the heart's pride of a good housekeeper.

The cabinet is verminproof and dustproof. The tight-fitting steel doors will make it possible to set aside one of the closets for the storage of winter clothes. Before locking this closet for the summer season, a small vial of DDT solution can be fastened in a position where the impact of the door will break it, releasing fumes in the enclosed space to destroy moth larvae in the clothing.

STAINLESS-STEEL MIRROR DOORS

Another feature that will please the housewife is the doors which close over the drawer-and-shelf compartments. These are covered on the inside with stainless steel. All that the housewife need do is to open the doors and—lo!—she has full-length mirrors to look into, as shown in Fig. 2.

These cabinets can be installed

* All drawings courtesy *U. S. Steel News*

in new or old houses. When built into new homes, they will take the place of walls, thereby saving up to six inches of partition space. When the cabinet serves as a partition between two rooms, it may be so divided as to provide drawer, shelf and closet space for both rooms, with the doors and drawers for the two rooms opening in opposite directions.

Can Be Seam Welded

This unit is being studied for a large housing project now being planned. It is an ideal item for resistance welding. The cabinet can first be assembled by spot tacking and then seam welded to obtain dust-tight seams.

The bedroom wall cabinet is an elaboration of an all-steel clothes closet that was introduced before the war. Prefabricated from 22-gauge sheet steel with a 20-gauge sheet steel door, it was equipped with shelf hooks and rod. Welded closets of this type were installed in the Colonial Village project near Pittsburgh as well as in numerous other houses and won enthusiastic acceptance. As in the case of the bedroom wall cabinets, the steel clothes closets can take the place of interior walls. Thus, in new homes, they save the cost of the wall they replace.

Another steel cabinet for which there are great possibilities is the all-steel linen closet, Fig. 3. Several manufacturers are studying this application of welded sheet steel, and it may be put into production soon.

The linen cabinet may be installed in new houses or in existing homes. When placed in a new home it may be connected with the clothes chute. Equipped with sliding doors, the cabinet will be practically airtight, as well as mothproof and verminproof.

This linen cabinet will provide "a place for everything," making it a delight to the orderly housekeeper. Its shelves will provide storage compartments for blankets, sheets, pillow slips, towels, wash cloths, bath mats, toilet paper and cleansing tissue. It will have drawers for tooth paste, soap, cleansing powder, floor wax and other cleaning accessories. A locked box will hold medicines—an important safety feature in a home with small children.

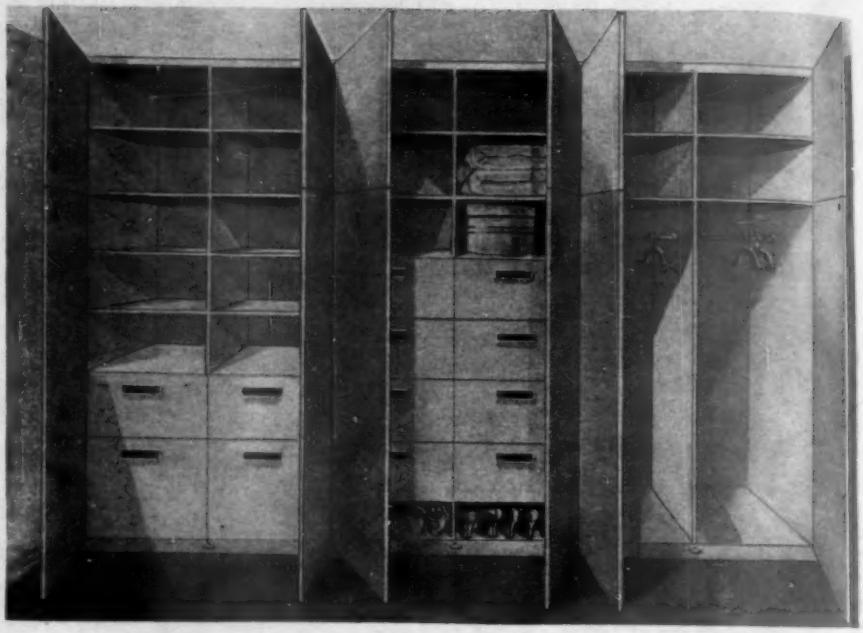


Fig. 1—This welded cabinet is designed to cover an entire bedroom wall. Tightly fitting doors close its separate dustproof compartments

Again, spot and seam welding will be utilized for the fabrication of these linen cabinets on the production line.

All-Steel Cabinet for Cans

The housewife will be equally pleased when she can buy an all-steel cabinet like the one in Fig. 4 for the storage of her canned goods. Such a cabinet has been designed so that it can be produced and marketed at a modest price. It is suitable for use in either the kitchen or in the basement and will supply a real need to supplant the common practice of storing cans on the basement floor or on make-shift shelves attached to the basement wall.

Shelving, incidentally, promises to be another important outlet for steel. Not only is lumber for shelving scarce, but the cost of installing wooden shelves is high. The contractor on one large housing project made an interesting discovery. He found that, though steel shelves were more expensive than wood shelves as delivered to the job, the wood shelves cost 25% more than steel shelves after the installation charges had been added. Yes, steel is cheaper than wood, and worms can't gnaw holes through it.

Another steel unit for the home, the prefabricated shower cabinet, has already proved its merits in both new and existing houses. Made from porcelain-enameled sheet steel or from stainless steel, the all-metal shower stall is good to look at and easy to keep clean. This, too, is an item for roller seam welding to provide the necessary watertight seams.

Bathtubs, too, are fabricated from sheet steel and finished in porcelain enamel, thus combining the advantages of a substantial saving in weight with the beauty of a lasting finish in any one of a variety of brilliant colors. Similarly, lavatories, sinks and laundry trays are pressed out of sheet steel and finished in porcelain enamel.

Stainless-Steel Toilet Bowl

Another unit now being considered for the home is the steel toilet, Fig. 5. The bowl, trap and drain pipe would be formed from stainless steel, while the supporting shell would be of porcelain-enameled sheet steel in color. This shell would fit against the wall and eliminate the unsightly trap and fittings. The use of a trip valve would eliminate the need for a

Fig. 3—This all-steel linen closet has a connection to the clothes chute and a locking medicine compartment. Its sliding doors (one set slides over the other set) make it mothproof when closed.

Fig. 4—This handy steel cabinet provides for the storage of canned goods

flush tank, thereby removing another obstacle to attractive design.

Stainless steel has already been used successfully for toilet bowls in railroad sleeping car roomettes, and there is no reason why such bowls would not be equally satisfactory in the home.

Yes, the trend toward steel in the home is everywhere evident. And the reason for this trend is that steel has dimensional stability, is easily fabricated into identical sections and is adaptable to numerous methods of finishing. It lends itself to mass production . . . in fact steel is the material that made mass production possible.

All of these and many other advantages of welded steel have led to its use in some of the commonest items of equipment in the home —electric and gas refrigerators, kitchen stoves, kitchen cabinets, electric toasters, electric mixers, electric irons, ironing machines and washing machines. All of these steel units have proved their worth and have made the housewife increasingly receptive to the idea of other household conveniences made of steel. To put it another way, the housewife has become accustomed to living with steel, and she likes it.

Everywhere steel is finding more and more adaptations inside the house. Home freezers of steel were beginning to come into vogue before the war and will probably be manufactured in large quantities in the years to come. Welded stainless-steel sinks† were being introduced side by side with porcelain-enameled pressed steel sinks and drainboards. Steel was finding increasing favor for casement windows and for wainscoting and wall tile.

Steel panels and tiles for both kitchen and bathroom walls are available in baked enamel or porcelain-enamel finish or in stainless steel. The tiles, which are square or rectangular, are usually pressed against an adhesive mastic which has been applied to the wall surface. The panels, either large rectangles or of full wall height, are pan-shaped or have overlapping welded edges and are installed with various types of fastenings. The market for porcelain-enameled panels and tiles is considered especially promising because they can be supplied in a variety of brilliant, lasting colors.

Prefabricated Steel Staircase

A steel unit for the home that is likely to win wide adoption in new houses, is the prefabricated steel staircase, Fig. 6. Introduced before the war, it has been installed in a considerable number of multi-storied dwellings as well as in single-family houses. It has the added strength of single-unit construction, and it is creak-free, fire-resistant and easily installed.

These stairs are usually made by forming or pressing the individual treads and risers and welding them to side stringers into a single unit easy to handle. They are usually put into place as an early step in house construction and are then used by the workers to go from floor to floor, eliminating hazardous ladders. With the completion of the house, the staircase is suitably painted, and linoleum or other composition surfacing is cemented to the treads, or else the entire length may be covered with a runner rug. Either way it presents a very attractive appearance.

One often hears the remark, "Oh, I just couldn't get used to living in a steel house." Oh, no? Housewives never objected to steel household equipment, and the majority of them would far rather have steel kitchen cabinets than wooden ones.

There is, of course, a conservative attitude toward the home arising from long association with

† See article, "Tomorrow's Kitchen Today," page 58, this issue.

conventional types of construction. This outmoded point of view, however, is steadily being broken down as more and more steel units are being introduced into the household to serve definite practical needs.

Conversion from Inside Out

Some observers say that the home is being converted to steel from the inside out. Complete wall cabinets, closets and staircases made of steel are but a step away from entire rooms fabricated from steel. It is not astonishing, therefore, that such units are now being offered on the market. A number of manufacturers have developed "packaged kitchens," and at least two are producing a combination kitchen-furnace-bathroom.

The use of steel for such structural parts of the house as floors, ceilings, walls, doors and exteriors also has broad possibilities. Just before the war a number of new buildings were designed for steel-panel construction in floors and ceilings. One Chicago project constructed of this design involved 281 dwelling units in a group of four-story buildings. These were recently examined and found to be in excellent condition. The steel panels were welded to the structural frame of the buildings. The single panels were 4 in. deep and provided both the ceiling of the floor below and the base for a wood-block floor above.

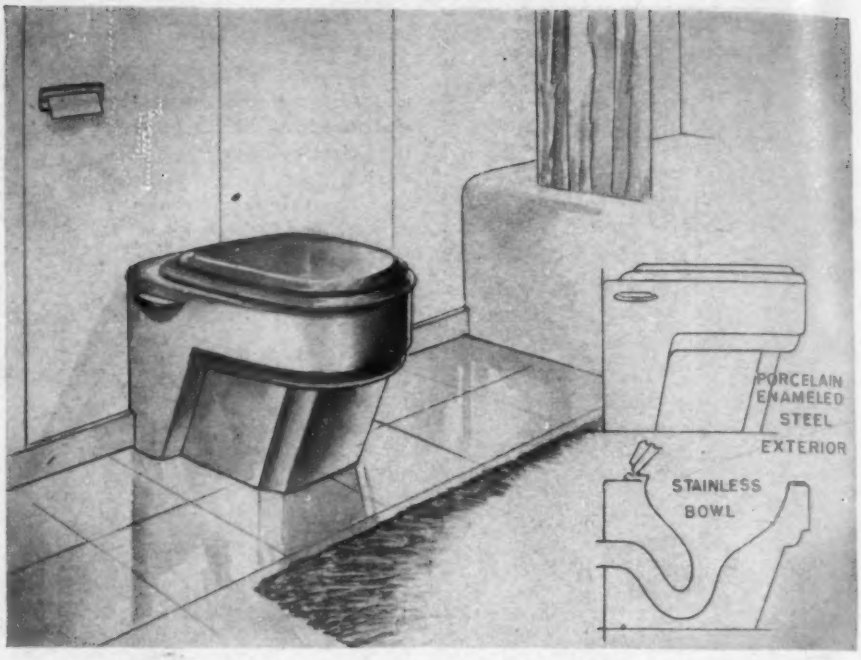


Fig. 5—A stainless-steel bowl and an enameled steel shell go together to make this modern toilet. The components must be assembled by welding

Steel panels similar in section can provide interior and exterior walls, not only for residential homes but for multistory apartment and commercial buildings. These sections would be room height and probably 16 in. wide and 4 in. deep, thus complying with the American Standards Association standard module system. Three 16-in. panels could be welded together in the shop to provide a 4-ft prefabricated house section for easy assembly. A 4-ft section of three plain sections with a window, another with a door (either sliding or standard hinged), two-panel window sections, two-panel and single-panel plain sections would give the architect a complete range to design the exterior of practically any dwelling.

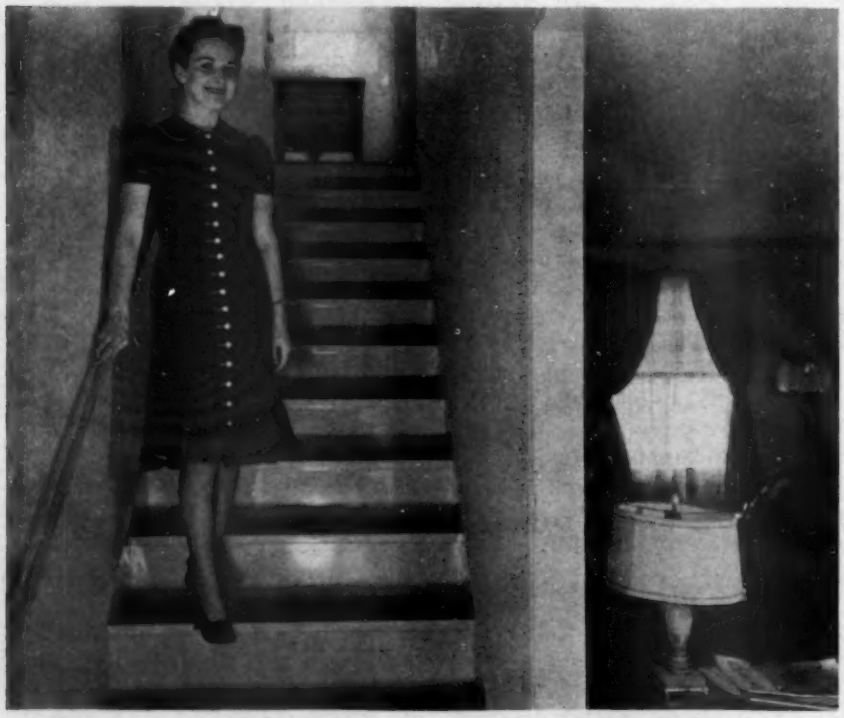


Fig. 6—Prefabricated steel staircase. The treads and risers are formed by pressing and are then welded to the side stringers into a single unit

Steel wall sections are ideal for radiant heating systems of various types—hot air, hot water, steam, even the possibility of electrical heat. Heating equipment, air filters, air-conditioning equipment, cooling equipment, electrostatic air-cleaning equipment and many other products will be produced of steel and fabricated to a large extent by welding.

If we consider these tremendous new fields for welding and also consider the many men returning from the services who have lived with welding and have been trained to use welding equipment, there can be no doubt that the future holds considerable promise for the welding industry.

★ CONSTRUCTION

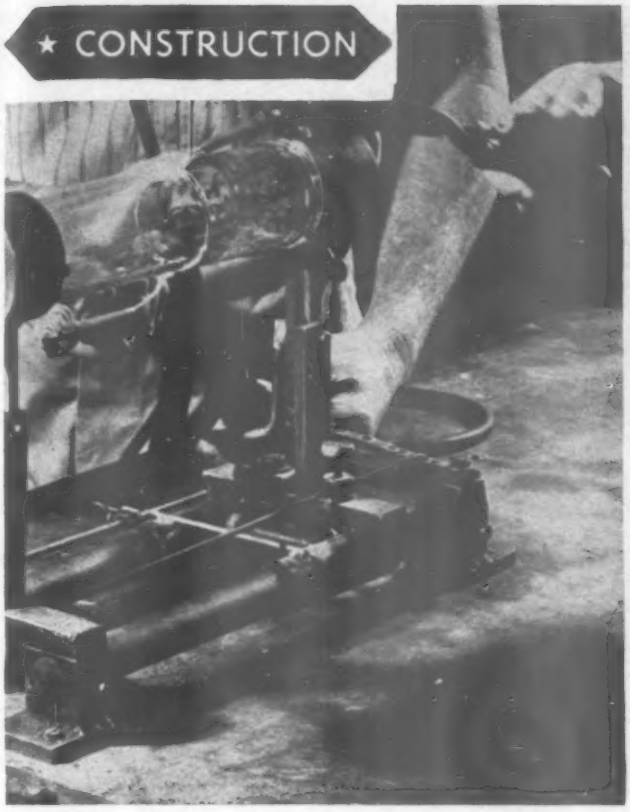


Fig. 1 (left)— Welding (sealing) two sections of glass piping. The oxy-hydrogen torch is attached to a high-frequency oscillator in order to conduct h-f current through the flame. Fig. 2 (right)—Cutting glass piping

Welded Glass Piping Systems

BY B. W. WHITEHURST
Engineer, Stone and Webster Engineering Corp.

The use of Pyrex piping for the conduction of chemical fluids is not new, but its large-scale field fabrication by cutting and welding methods marks a gigantic step forward.

BORO-SILICATE glass piping, known under the trade name of "Pyrex," has many advantages in the food-processing industry and the manufacture of bio-chemicals as well as in general chemical processes. Among these advantages may be mentioned its resistance to most acids and also the transparency of the piping, which permits the operator to observe the processed material as it flows.

In connection with the building of the Clinton Engineer Works at Oak Ridge, Tenn., the Stone and Webster Engineering Corp. was given the task of installing over 7½ miles of glass piping in diameters up to 4 in. To accomplish this gigantic task, a field shop was erected with bench-model sealing jigs and electric glass cutting, sealing and stress-relieving equipment for the fabrication of glass piping in a manner not unlike the cutting, welding and fabrication of steel pipe. This occasion represented the first time in engineering history that the large-scale field fabrication of glass piping was attempted and successfully completed.

MADE 15,000 WELDS

Many novel techniques were developed and used by the construction forces, and methods heretofore considered as laboratory practices were converted overnight to standard field procedures. Some idea of the magnitude of the job may be realized when one considers that over 35,000 cuts were made in the glass piping and over 30,000 sections of glass piping were fused together, necessitating the making of 15,000 welds. Over 3,000 special fittings were made, some of these exceedingly complex.

Fig. 3—Annealing a welded section in a portable resistance-type furnace

Prior to this time, the orthodox method of equipping an installation with glass piping was to submit to the supplier an assembly drawing showing the location of each piece of equipment and the location of the connecting piping runs and detailed drawings of the individual glass fittings if they were of a special nature. The supplier of the material prefabricated the glass piping and shipped it, packed in excelsior, to the site. It was then unpacked, assembled and installed.

This method lacks flexibility, but prior to the war it was considered by engineers to be satisfactory. Obvious limitations to its use arise in cases where the location of heavy equipment is changed to conform to revisions of flow diagrams, or when the design or location of the equipment outlets are not crystallized. These and similar conditions require revision of drawings and further negotiations with the supplier, causing delays in deliveries and thereby endangering prescribed completion dates.

Under impetus of the exceedingly close time schedules prescribed by the War Department, engineers of the Stone and Webster Engineering Corp. reasoned that the solution to the problem lay in the cutting, welding and fabricating of the glass piping in the field.

The Corning Glass Works, Corning, N. Y., coöperated in this undertaking by leasing several sets of glass welding equipment and by assigning one of its engineers to impart techniques of glass manipulation to two selected pipefitters. Much credit goes to these pioneers for the painstaking manner in which they applied themselves.

Train Glass Pipefitters

Because of the difficulty of obtaining proficient glass workers, pipefitters who had been accustomed to the handling of steel piping were trained to fabricate glass. By the time the fabrication of glass piping and fittings had reached its peak, about 25 pipefitters had become skilled glass artisans.

In the hands of skilled glass workers, boro-silicate glass piping offers the flexibility of metal piping in bending to special shapes and in the fabrication of manifolds. The sealing, bending and flanging operations, however, require specialized techniques, which, in general, closely follow those of soda-glass manipulations except that higher temperatures are required. The gas flame alone, even at temperatures of the oxy-hydrogen torch, does not supply sufficient heat to make a satisfactory seal in any but thin-wall tubing.

Another difference from metal piping is that great care must be exercised in the annealing of freshly made seals to remove the stresses incurred during the heating and fusing of the pipe sections and the subsequent cooling of the heated areas.

The installation of glass piping demands close attention to support and hanger details, to the correct alignment of the piping axially, and to the parallel alignment of the flange faces before the bolts are taken up. The insertion into the pipe line of expansion or slip joints, or the use of loops to compensate for thermal expansion, must also be considered. Where the piping is to be run along walls and columns, adequate protection should be provided against damage by collision. Likewise, protection from falling objects must be afforded, and the placing of ladders and other construction equipment against the installed pipe avoided.

Glass Cutting Procedure

The cutting of glass piping is one of the earliest arts perfected in glass manufacture. Soft soda glass was scored peripherally with a sharp-edged flint or a file, and the glass was broken apart by smartly tapping it or else by touching the score mark with a hot metal rod.

Of the several methods available today for the severing of glass tubing and piping, the use of a hot wire loop applied peripherally to the piping was selected as being the most speedy and satisfactory. This ancient method is still a favorite.

First, a score mark about ¼ to 1½ in. long, depending upon the circumference of the pipe, is deeply scratched at the point where the pipe is to be separated. A nichrome wire loop is then adjusted around the glass tubing at the score mark, and electric current controlled by a "Variac" transformer is applied to the wire (see Fig. 2). The wire is held taut, heated to a dull red and held at this temperature for approximately one minute before the current is turned off. When all color fades from the wire, it is removed and a damp cloth is applied, first to the score mark and then slowly wiped around the heated circumference of the pipe. The re-

sulting strains usually cause the pipe to break clean. Sometimes towards the end of the heating period a crack may start at the file scratch and travel completely around the pipe to cause it to break asunder. Should the initial crack not extend through the pipe wall or not completely encircle the pipe, a smart rap is all that is required to effect the separation.

Certain precautions are necessary for the successful severance of the pipe. It is essential, for example, that the hot wire make a uniform contact with the surface of the pipe. This is readily accomplished by forcing the hot wire to the glass surface by means of a carbon paddle. The pipe should be well supported, preferably on wooden vee-blocks, during the cutting operation. Accuracy in cutting the pipe edges squarely with the pipe's axis is extremely important. The squareness of the cut may be readily checked by standing the flanged end on a flat surface and measuring the length of the pipe as it is rotated.

IN JULY, 1944 ("Shadows of the Future," page 45), THE WELDING ENGINEER prophesied a greatly increased use of glass in structural fields in piping systems and similar installations and suggested the likelihood that some form of gas welding, resistance welding, high-frequency induction heating or even arc welding might be developed for the broad-scale fabrication of glass.

These times are too fast for prophets, whose imaginings are being realized almost before they can be cloaked in language. Even as our modest speculations on the future of glass welding were being written, Stone and Webster Engineering Corp. was undertaking, in strictest secrecy, the installation of over 7½ miles of glass piping at Oak Ridge, Tenn. Details of the many novel techniques developed for glass welding, cutting and stress relieving are now presented as accomplished facts instead of fantasy—THE EDITORS.

SEALING TECHNIQUES

One of man's great advances was made several thousand years ago when some anonymous citizen of the ancient Mediterranean world discovered that heated glass changes from a solid to a viscous state in which it can be worked into various sizes and shapes. However, the art of sealing as a means of uniting sections of tubing into one continuous piece did not become economically important until glass tubing became an article of commerce.

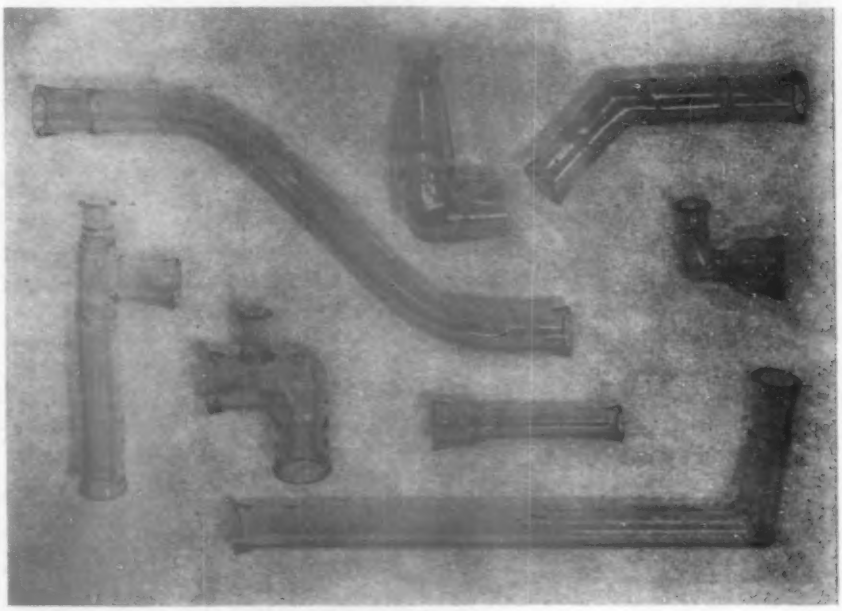
The sealing of Pyrex glass tubing in moderate wall thickness is a relatively simple process, well known to every chemist and physicist. For such work the heat of an oxy-hydrogen gas flame is adequate. Flame heating, however, produces unsatisfactory results in sealing thick-wall tubing of large sizes since the outer surfaces may be overheated and the inner surfaces not attain a high enough temperature to insure a satisfactory seal.

Fortunately, glass becomes electrically conductive when it has been sufficiently heated. If high-frequency currents of sufficient magnitude are caused to flow through the pipe, it will be uniformly heated throughout the wall's cross section and thus become sufficiently plastic to permit satisfactory sealing. The preheating flame, needed to render the glass conductive, is applied by two oxy-hydrogen torches. To the tip of each torch is attached a lead from a high-frequency oscillator. The current is then conducted to the glass by the active ions in the flame.

The significant development in this sealing process is the use of high-frequency currents for heating the glass. As has been pointed out, the flame method breaks down because sufficient heat cannot get through the glass wall, but when the high-frequency currents are superimposed on the gas flame, the entire thickness of the wall becomes highly and uniformly heated.

The procedure for welding two pipe sections is illustrated in Fig. 2. First, the two sections are

Fig. 4—Over 3,000 special piping details such as these welded glass products had to be fabricated for the piping runs at Clinton Engineer Works



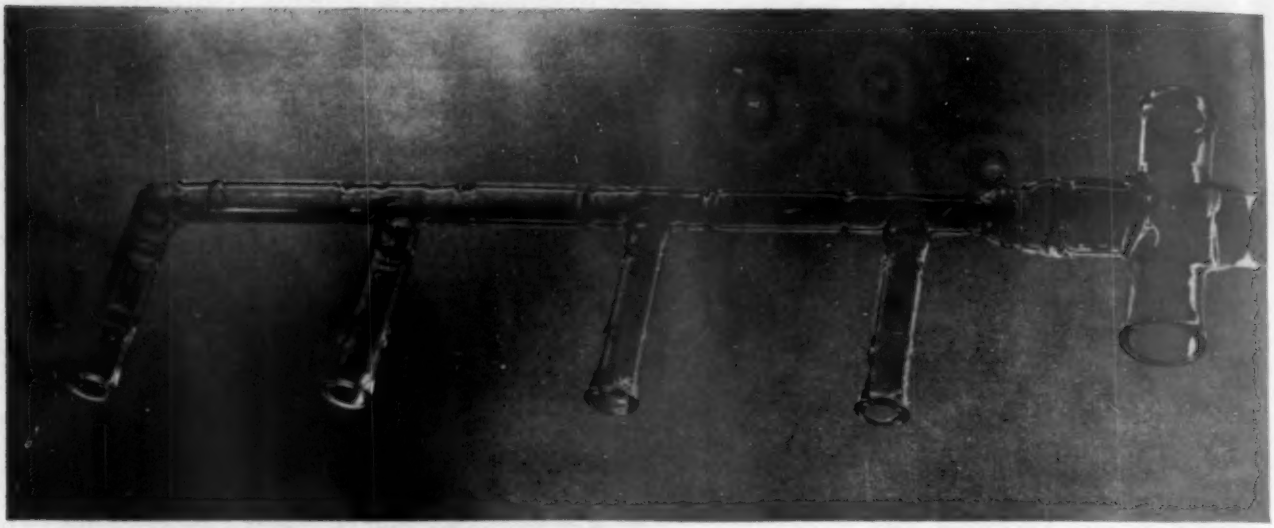


Fig. 5—This fabricated glass manifold required 35 cuttings and 18 separate welds

mounted in a jig designed to align them axially and hold their edges square with the pipe's axis. After alignment is assured, the ends are separated about ½ in. and are preheated with an oxy-hydrogen flame until they become hot enough to be electrically conductive. The two adjacent ends are then brought into intimate contact with each other, and the high-frequency current is caused to flow through the flame and the heated section of the glass until the seal is fused.

The seal is shaped by blowing a slight pressure into the pipe, by stretching it slightly and by wiping the seal with a carbon paddle of sufficient width to bear upon the relatively cold part of the glass. The seal is then permitted to cool slightly before the piece is removed from the jig for electric annealing.

Annealing Advances

One of the greatest advances made in the art of glass fabrication was the discovery that its brittleness could be overcome by heating it to a temperature close to the viscous point and then permitting it to cool (without subjecting it to draft) until it had reached a temperature approximating that of the ambient air. Archaeologists believe that annealing of glass was first discovered around 1500 B.C. and was kept a guarded secret by the Phoenicians and Egyptians.

The stress relieving of glass is today particularly necessary in the installation of long lengths of glass piping, which may be subject to stresses incurred by changes of temperature of the fluids passing through or by handling during installation.

Though in most cases the stress relieving or annealing of a piece of glass pipe or fitting is a simple procedure, it nevertheless requires close attention to details. Severe stresses are incurred during the process of sealing boro-silicate pipe, which, if allowed to cool to room temperature after sealing, might soon break apart at the point of seal. In order to prevent such breaks, stress relieving is imperative.

Annealing is accomplished by heating the seal and the adjacent areas two or more inches beyond each side of the seal with a portable electric oven (Fig. 3). The heating is continued for a period of 6 to 12 minutes, after which the heat is turned off and the pipe is permitted to cool within the annealer to approximately room temperature.

Frequent rotation of the piece during annealing is recommended in order to insure that the heating will be uniform. It is also important to keep the piece being annealed from being subjected to a draft or to a sudden change in temperature.

Polarized Light Test

To the unaided eye, a piece of unannealed and highly strained glass pipe appears no different from a piece that is well annealed and strain-free. There is, however, a method of differentiating them. When a piece of annealed glass is viewed through a polariscope there is little evidence of color, but when a piece of unannealed pipe is so viewed brightly colored bands appear to indicate the strain. The colored bands result from the glass under strain becoming doubly refractive.

Plain polarized light passing through a region of strain decomposes into two rays, polarized respectively parallel and perpendicular to the direction of stress. These rays pass through the glass at different velocities and emerge with a phase difference proportional to the stress and thickness of the glass. Severely strained pieces may show successive rainbows of color. The frequency and intensity of these colors enable the operator to judge the severity of the strain and the progress of annealing as well as the length of time the piece should remain in the annealer.

In general, thick-wall piping shows more color under stress. By the same token, more color may be permitted in the annealed piece than would be the case with thin-wall pipe. A temperature around 500 C (932 F) is required for the annealing of thick-walled pipe, and the rate by which it is cooled should not exceed 25 to 35 C (77 to 95 F) per minute. This implies a cooling period of about 15 minutes for a glass pipe 2 in. in diameter and ⅛ in. thick.

(continued on page 51)

★RESEARCH

Furnace-Brazed Steel Parts

BY J. E. JEVONS
Ph.D., B.Sc., F.R.I.C.

"Copper brazing," as the term is used in England, means a production process which differs from ordinary soldering and brazing about the same way as a hand cutting torch differs from a motor-driven flame-cutting machine.

COPPER BRAZING is based on the remarkable facility with which, in the presence of hydrogen or some other suitable reducing atmosphere, molten copper "wets" steel and penetrates by capillary attraction through very narrow spaces in assembled steel parts. The reducing atmosphere serves a dual purpose: to prevent oxidation and to reduce oxides already present.

Copper-brazed joints have, for reasons which will be explained later, a strength usually substantially greater than that of copper and sometimes even greater than that of low-carbon steel.

The first British patent covering the copper-brazing process was taken out by Augustus Charles Hyde in 1910.[1] Unhappily, Hyde failed to convince industrialists of the value and possibilities of the process; the only firm which tried it gave it up because of the risk of explosion arising from the use of hydrogen in furnaces of relatively large size. The safer and less costly industrial gases now in common use were not then readily available.

First Successful Use

Except for the attachment of small tungsten pellets to steel rivets to make magneto and other small electrical contacts, the process remained neglected until 1933 when it was adopted by a large firm of automobile accessory manufacturers[2] to replace riveting on a small window-winder component. The brazing operation was carried out at first in the tiny furnaces used for the attachment of tungsten contacts. The resulting gain in strength and the reduction in manufacturing costs of this part were so striking that other applications were quickly tried and larger furnaces were constructed, thorough purging being relied upon to prevent explosion of the hydrogen atmosphere. The marketing of plant specially designed for copper brazing was soon followed by the replacement of hydrogen by safer atmospheres generated in self-contained units adjacent to the furnace proper.

The latter step definitely established the process as a valuable assembly method offering unique advantages. Its possibilities were quickly appreciated by production engineers in the United States, where larger outputs and the availability of cheaper natural gas for the protective atmosphere made the process more widely applicable than in Great Britain. During recent years steady development has proceeded simultaneously in both nations.

As the process is carried out under industrial conditions, the initial step consists of assembling the steel components with definite clearances and in such a manner that they remain in the designed position until the braze has been made. A suitable amount of pure copper in the form of wire, foil or sometimes powder (applied as a paste) is placed in a position from which it will readily flow into the spaces to be filled. The prepared assemblies are then heated in a reducing atmosphere to a temperature slightly above the melting point of copper and (usually) cooled in the same atmosphere so that the steel emerges clean and bright.

Good and Too-Tight Fits

Fits are most important. Generalization is difficult because the length of the joint, the size of the component and the nature of the surface all exert an influence; nevertheless, it can be safely said that anything between a light interference fit not greater than 0.001 in. and a clearance of 0.001 in. will give a strong joint. The advantage of an interference fit (as distinct from a clearance fit) is that the components of the assembly are held in position during brazing without the help of jigs or other fastening methods.

Fig. 1 shows a section cut transversely through a good copper-brazed joint between two pieces of low-carbon steel. Compare this photomicrograph with Fig. 2, a section through an assembly in which the interference fit was too tight for the copper to penetrate completely. If the copper fails to penetrate, the strength of the joint depends on the extent to which actual pressure welding of the steel surfaces themselves occurs. Fig. 2 shows clearly the actual union which has occurred locally between the ferrite crystals of the low-carbon steel surfaces.

Although this true union of iron crystals gives a strength equal to that of the base metal, the catch is that it generally takes place only in small isolated areas. Hence

[1] British Patent 5,232/1910.
[2] Messrs. Joseph Lucas Ltd., Birmingham.

(except in laboratory specimens accurately mated and of extreme smoothness) the strength of joints where the copper fails to penetrate cannot be relied upon.

Clearances larger than 0.001 in. can often be used if the copper is not required to flow very far by capillary attraction.

Continuous Furnaces Best

Furnaces for copper brazing are usually of the continuous type in which the work is placed on a heat-resisting nickel-chromium wire-mesh belt which travels through a long gastight tunnel. The entrance end of the tunnel (after a short length which acts as a gas seal) is surrounded by a furnace that is heated either by gas or electricity and fitted with automatic temperature controls. The remainder of the tunnel is surrounded by a water jacket and forms a cooling chamber extending to the exit.

Batch-type furnaces, although far less expensive, are less suitable for quantity production. At the start of each batch the furnace chamber has to be thoroughly purged, and when the chamber is opened at the end of the cycle the whole of the protective atmosphere within it escapes to waste. Notwithstanding these and other drawbacks, batch-type furnaces offer advantages for certain special applications which will be discussed later.

Types of Atmospheres

Whatever type of furnace is used, the provision and maintenance of an efficient reducing atmosphere within the heated inner chamber is an essential feature of the process. For reasons already stated, pure hydrogen is hardly ever used today, except in very small furnaces: in this country (England) cracked ammonia[3] containing from 8 to 10% of hydrogen and burnt town's gas,[4] which usually contains from 11 to 15% hydrogen, are the most popular industrial gases.

[3] Obtained by cracking or breaking down ammonia by heating it to about 1,020 F in a tube containing a catalyst. The resulting mixture of 3 parts hydrogen and 1 part nitrogen is burned with a controlled proportion of air, and the product dried for service.

[4] Made by burning town's gas (city gas in the U.S.) with a controlled proportion of air and then drying and purifying the product.

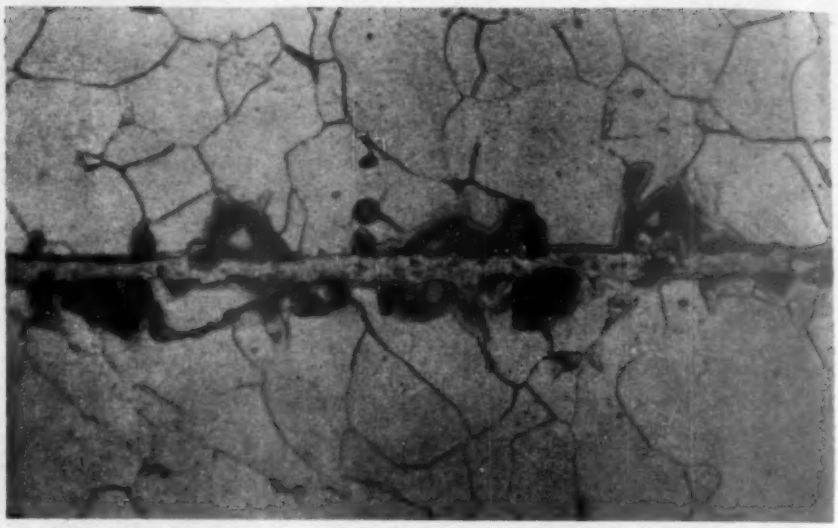


Fig. 1—Photomicrograph of a good copper-brazed joint between two low-carbon steel parts. The copper has penetrated through the steel

When adequately dried[5] either of these gases will enable steel to be copper brazed satisfactorily.

A central generating installation is sometimes used in large factories to supply a number of brazing and perhaps other kinds of heat-treatment furnaces; usually, however, a small gas-generating plant is attached to each brazing furnace, thus converting it into a self-contained unit.

Times and Temperatures

Laboratory experiments show that the time during which the copper is molten has a slight influence upon the mechanical strength of the brazed joint produced. Under production conditions, however, a period of from 5 to 10 minutes *at brazing temperature* will be found satisfactory. The time needed to reach this temperature, usually about 2,050 F, will depend, of course, upon the size of the components, the weight of the charge and the heat capacity of the furnace used.

If steel parts are not allowed to emerge from their protective atmosphere until they have cooled to a temperature of 300 F, they will have a perfectly clean, slightly etched silver-gray surface. Being chemically clean, this surface will rust very quickly unless given an immediate protective covering.

From the mass-production aspect, one of the most excellent features of the copper-brazing process is the rapidity with which brazed work can be inspected. A glance suffices to show the inspector whether copper has emerged from the joint on the side opposite that on which it was placed prior to brazing. If this has happened, it is safe to assume that a satisfactory braze has been achieved.

Causes of Failure

There is so little to go wrong in the copper-brazing process that failure can usually be traced to one of four simple causes: (1) failure to attain brazing temperature, (2) failure to maintain an efficient protective atmosphere, (3) incorrect clearances on assembled components or (4) interruption of the capillary flow of the copper by some design feature of one of the components.

The fourth item is apt to be overlooked if the fundamental principles of the process are not understood. To give a common illustration, if one of the two components to be mated together has a sharp fillet and the other a beveled corner, a cavity will result which will usually prevent the copper penetrating beyond it.

Designers must remember that passage through the brazing furnace will anneal all steels except those which possess air-hardening

[5] Drying can be conveniently carried out by removing the bulk of the water by refrigeration and then passing the gas over either silica gel or activated alumina.

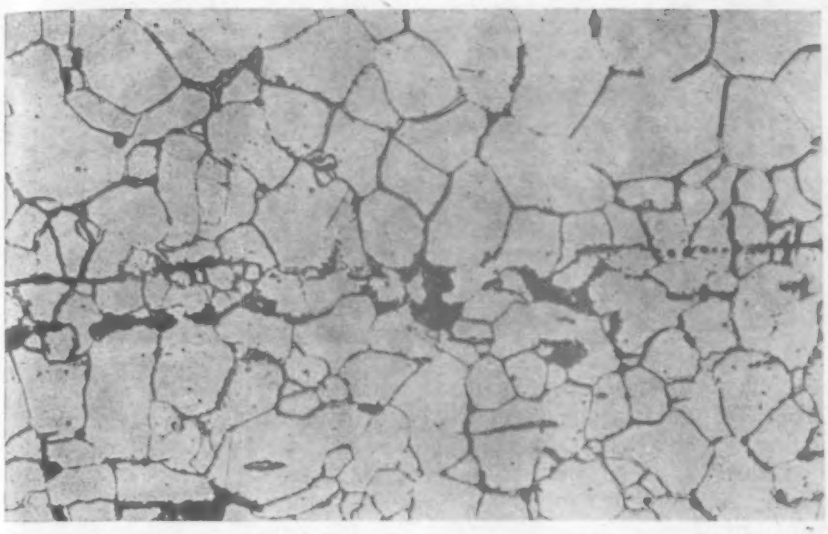


Fig. 2—In this copper-brazed joint, the interference fit was too tight for the copper to penetrate completely. Crystal union through pressure welding of the steel has occurred in the central area

tendencies and will also reduce to a low value the impact strength of a medium or high-carbon steel. However, parts made from steels which respond to heat treatment can usually be heat treated after brazing to give the desired tensile strength and impact value.

It is also necessary to note that the surfaces of steel parts will be decarburized to depths of some thousandths of an inch by the action of the protective atmosphere. This is quite often of no consequence; when detrimental, it can be prevented by copper plating the parts prior to brazing.

Lest it be assumed that the size of assemblies which can be brazed is restricted only by the size of the tunnel aperture, a word of caution must be given. The *width* of the tunnel of a continuous furnace may be increased to large size, but the *height* is limited to about 8 in. If the height is increased much beyond that figure, the maintenance of an adequate protective atmosphere within the tunnel becomes both difficult and costly.

Strengths of Joints

Except in rare instances, a brazed joint will be stressed in shear. Provided that the fit of the unbrazed assembly is within or very close to the range already mentioned (0.001 inch interference to 0.001 inch clearance), copper-brazed joints made under industrial conditions should have a shear strength of from 22,000 to 30,000 psi; 26,000 psi is a fair average value. If the fit lies much outside this range, the strength of the brazed joint falls off rapidly.

For comparison, the shear strength of annealed copper is about 18,000 psi and that of low-carbon steel about 28,000 psi; thus in parts made of low-carbon steel the shear strength of the braze compares with that of the parent metal.

The reason why the shear strength of the copper-brazed joint exceeds that of copper is not yet fully understood. The explanation appears to lie partly in the fact that molten copper dissolves iron very quickly, forming a copper-iron alloy that is stronger than pure copper. The peculiar properties of thin films may also have something to do with the strengths of brazed joints.

Suggested Applications

In the space of a short section, it is difficult to give even an outline of the many applications to which the copper-brazing process can be usefully put in modern quantity production. Copper-brazed assemblies are already used extensively in automobiles, refrigerators, cash registers and typewriters, to give only a few examples. During the war the production of a large number of special articles and components was speeded up enormously by the use of copper-brazing.

The majority of copper-brazing applications fall into one of two categories: (1) to replace joints previously made by other methods such as welding, riveting, staking, screwing or pressing together; (2) to substitute for parts being machined from solid bars or rounds. A good illustration of the latter is a small bell-crank, a part costly to machine, even from a forging. The two shafts can be brazed simultaneously to a blanked and drilled web at a very great saving in both metal and machining time. For many applications, size stock can be used for both the pin and the shaft, thus eliminating all machining operations other than cutting off the desired lengths.

The high capital cost of a large continuous furnace may at first sight seem to be a serious impediment to the use of copper brazing. Experience has shown, however, that production costs are so reduced by furnace brazing that substantial saving is invariably shown within a fairly short time.

Batch Brazing

As a means for brazing parts being made in comparatively small numbers, the use of boxes or batch-type furnaces deserves more consideration than has hitherto been accorded to it. Batch brazing can be carried out satisfactorily in sealed muffle furnaces or even in gas-tight boxes heated in ordinary furnaces. It is true that with this method the whole of the protective atmosphere is lost with each furnace charge, but the cost of this loss will usually be recovered several times over by savings in machining operations. The introduction with each batch of work of some substance which will decompose to provide a suitable atmosphere would make the batch method still more attractive by reducing both the capital outlay and the running cost.

When designers and production engineers become better acquainted with the copper-brazing process, it is certain to be used more widely—and not only for the continuous quantity-production of very large numbers of small parts.

★ PRODUCTION

Shaped Parts Produced Economically

BY J. A. GOWEN

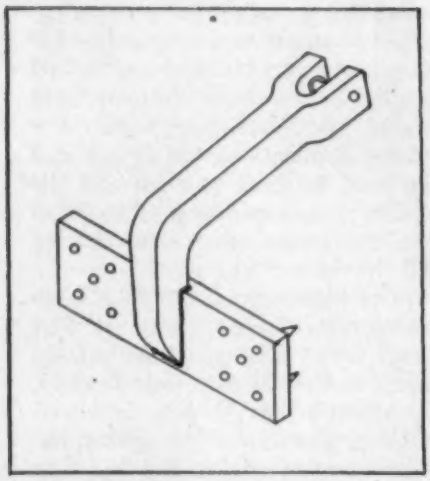


Fig. 1—Sketch of fabricated lifting hook showing how the body of hook is cut in two planes and bent to shape. The welded crosspiece has five conical studs at each end

Multiple torches added to a multiple template enable 32 parts to be cut from a plate without attention by the operator.

A FABRICATED part made by successive operations of flame-cutting, bending, grinding, machining and welding was—believe it or not—found to be two-thirds cheaper than the same part made simply by forging. This part is a package lifting hook, Fig. 1. Used in pairs to grip the sides of wooden packing cases, these hooks have conical studs which bite into the wood when crane power is applied. Their use eliminates the need for the laborious looping of ropes around the boxes, and thereby expedites loading and unloading.

The clue to the economy of the multiple operations as compared to forging is found in the feasibility of flame-cutting a flat blank and then forming it to the required shape. At the Mecano Ship Repair Corp., Jersey City, a multiple-torch shape-cutting machine (Fig. 2) cuts out the blanks from 2-in. plate at the rate of eight finished pieces in about 5 minutes cutting time. Set-up time in moving from one batch of eight to the next is reduced through the use of a multiple template, Fig. 3. This template consists of four identical steel cams that are bolted in nested formation to a base plate clamped to slots in the top of the tracing table. The magnetic tracing roller follows the contour of each cam in succession, traveling automatically from one to the next and cutting eight blanks each time. There is no need to interrupt work to shift the location of either the workpiece or the template since the torches are spaced sufficiently far apart to permit the four groups of parts to be nested and cut from one plate without shifting any part of the set-up. The wide spacing of the torches is also desirable to minimize creeping of the plate, such as would occur if the eight torches concentrated their heat in a comparatively small area of the workpiece.

Another interesting aspect of this set-up is the installation of a dust collector. Suction intakes beneath

Photo and sketches courtesy Air Reduction Sales Co.

Fig. 2—The wide spacing of the eight torches permits three other hook bodies to be nested in the intervening space. The four large exhaust hoses of the dust collector can be seen passing beneath the table at right

Fig. 3—This multiple template enables 32 pieces to be cut (eight at a time) without head adjustment. The shift is made automatically from template to template

the cutting table draw off the dust and oxidized matter, clearing the air for the benefit of workmen and removing abrasive matter injurious to machines.

The profiled parts are flame-cut in a second plane to produce a rounded end and a notch for the crossbar, to be welded in place as shown in the sketch. The blanks are then heated and bent to the proper angle by five blows of an air hammer. The forked end is drilled and a pin with a sleeve roller set in. The crossbar with its ten previously drilled holes is aligned and welded to the body of the hook, and the corners are lightly rounded with a grinder. Finally, the pointed studs are inserted; these are held with nuts and lock washers and so are readily replaceable when they are worn down.

The speed and economy of this method of fabrication is evidenced by the fact that the cost of the finished lifting hook has been reduced 66⅓% of the cost of the simple forging.

WELDED GLASS PIPING

(continued from page 46)

In the hands of skilled artisans, there is no apparent limit to the complexity of special piping details that may be fabricated. It is estimated that over 3,000 special piping details such as eccentric and concentric reducers, crosses, side outlet tees, offset bends and complex manifolds were used in the fabrication of the piping runs at the Clinton Engineer Works. Some of these are shown in Fig. 4.

In fabricating the manifold shown in Fig. 5, over seventy major sequential steps were required. These comprised 35 cuttings to reduce the section to size or to square the ends, and 18 separate welds to assemble the sections into a completed unit. After welding each section onto the preceding united sections, it was necessary to remove the assembly from the sealing jig and anneal the freshly made weld before proceeding with further fabrication. The accuracy attained between the outlets of special fittings approximates that of metal fabrication.

The manufacture of these special details by the field forces repeatedly saved many days, sometimes weeks of delay. Promises of delivery for special fittings from the factory would, in many instances, be from one to two months. Field fabrication of the simpler type of special fittings required but 1 to 3 hours; the more complicated types perhaps one man-day.

Alignment During Installation

The success or failure of a glass piping installation depends to a great extent on the manner in which it is installed. Care in the selection of the proper type of hanger is important. Equally important are the axial alignment of the pipe flange with the equipment outlet and the careful tightening of the flange bolts.

Stone and Webster developed a procedure which resulted in a new solution of some of the commonly encountered construction difficulties. For example, when a piece of flanged equipment was moved and relocated, the outlet flange was found to be 2 in. or more out of axial alignment with the connecting tee some 5 ft away and the flanges of the tee and the equipment outlet were 8 deg. out of parallel. This particular piece of equipment protruded through the floor above, and the equipment outlet was near the ceiling, making accurate measurements difficult. Freedom from strain in the connecting piping was imperative, but this was difficult to attain after the bolts had been tightened in the make-up flanges. After two fruitless attempts to fabricate a satisfactory offset piece of the exact length and with the flanges in correct alignment, it was decided to try to bend the connecting pipe in place.

A piece of flanged pipe slightly shorter than the distance between the flanges of the equipment and the tee was secured rigidly to the outlet fitting of the stationary equipment. The other end of this pipe was supported by means of a rope hanging from the ceiling. Two small electric annealing furnaces were suspended in place in such a manner that the heating surfaces were concentric with the pipe to be bent. The glass was heated until it showed signs of softening, at which point the pipe was pushed into the direction of the tee outlet until the flanges were aligned axially. The ring closures were put into place, the gasket inserted, and the bolts drawn up slowly. This procedure stretched the piping until the flange faces were in intimate contact. When this objective had been achieved, the electric current was turned off, and the pipe was allowed to cool with the annealing furnaces still suspended in place in order to keep the cooling pipe free of drafts. After removal of the annealing furnaces, the connecting piece was carefully examined with a portable polariscope and found to be free from strains.

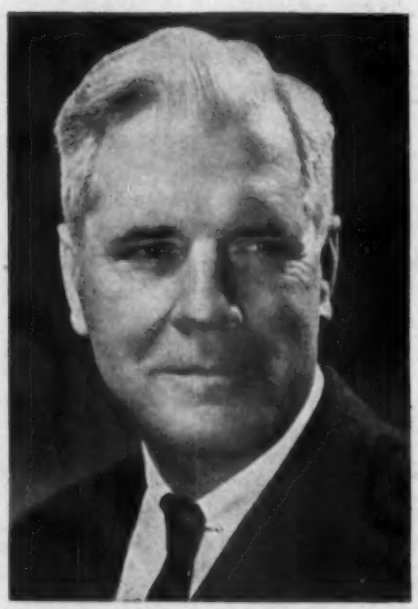
It is evident that on large scale installations of glass piping many operations heretofore confined exclusively to the shops of the supplier may be profitably transferred to the field. Furthermore, the field welding and fabrication of Pyrex pipe may be considered an acceptable engineering procedure.

AWS Prize Winners

A galaxy of bright stars in the welding firmament will guide the destinies of the American Welding Society during the coming year.

All sections of the United States are well represented by the officers and directors chosen at the 27th annual meeting of the American Welding Society, held in Atlantic City, Nov. 17–22. Reflecting the ever increasing importance of the Pacific Coast in welding affairs, the new president, L. W. Delhi, has been chosen from that area.

Mr. Delhi was vice-president in charge of shipbuilding operations of Hunt, Mirk and Co., San Francisco, a firm recently purchased by the Consolidated Steel Corp. of Los Angeles. Under his direction more than 48 all-welded C-3 vessels were designed and constructed for the Maritime Commission. He has long been active in promoting the interests of the American Welding Society on the Pacific Coast, having served two years as regional vice-president and currently as national director, AWS. Recently he was drafted to serve as president of the California Metal Trades Association, an organization representing more than 350 central California firms employing approximately 26,000 men. He has been one of the outstanding proponents of the use of automatic arc welding for ships, boiler drums, penstocks, oil refinery equipment and other quality plate work.



James F. Lincoln, winner of the Miller Memorial Medal for "conspicuous contributions to the advancements of welding or cutting"

New Vice-Presidents

The first vice-president is Harold O. Hill, assistant chief engineer, fabricated steel construction, Bethlehem Steel Co. His organization activities include the chairmanship of the AWS committee which prepared "Rules for Field Welding of Storage Tanks," chairman of the API-AWS conference committee on the welding of storage tanks, member of the AWS symbols committee, member of the AWS committee on standard qualification procedure, chairman of the AWS coördinating committee on research, member of the AWS-AWWA committee on specifications for field welding of steel water pipe joints, member of the AWWA-AWS conference committee on elevated steel water tanks, standpipes and reservoirs, member and past chairman of the AWS technical activities committee and member of the AWS committee on honorary membership and honorary directorship. He was director-at-large of the Society during the years from 1940 to 1943 and served on its executive committee for the past eight years.

George N. Sieger, president and general manager of the S-M-S Corp., Detroit, is the Society's second vice-president. A colorful figure, Mr. Sieger is one of the best liked men in the entire welding industry. He graduated from Lehigh University in 1912 with a degree in electro-metallurgical engineering and eventually became executive metallurgist of P. R. Mallory & Co., of New York and Indianapolis. He left Mallory in 1933 to organize the S-M-S (Specialized Metal Service) Corp., to which company he has since devoted his exclusive time. Mr. Sieger has been secretary-treasurer of the Detroit Section, AWS, since 1941 and is chairman of the national membership committee and a past district vice-president.

Directors-at-Large

The new directors-at-large for the 1946–47 term are J. F. Maine, D. H. Corey, E. L. Mathy and Leslie S. McPhee. Mr. Maine has been associated with the fabrication of iron and steel since 1908 and has been chief engineer of the Republic Structural Iron Works for the past 23 years. He has been chairman of the Cleveland Section, serving two years, and also district vice-president of AWS. At the present time he is working with the City of Cleveland in order to get adopted a new building code permitting welding.

D. H. Corey has been welding engineer of the Detroit Edison Co. since 1933, just prior to the utility's adoption of welding for the erection of high-pressure piping. He is the author or co-author of several papers dealing with various aspects of the welding of piping for severe service conditions, has served on a number of AWS and joint committees and was chairman of the committee which prepared Chapter 41A, Industrial Piping, of the Welding Handbook. He has also served as secretary-treasurer, vice-chairman and chairman of the Detroit Section of AWS.

E. L. Mathy, first vice-president of the Victor Equipment Co., San Francisco, has lived in California since 1912 and has been connected in one way or another with the welding industry for the last 30 years. Prior to his association with Victor in 1928, he was Pacific Coast sales representative for Air Reduction Sales Co. He is a member and a past-chairman of the San Francisco Section of AWS and a director of the IAA.

Leslie S. McPhee, who is charge of all welding and cutting opera-

and Officers . . .

tions at the Whiting Corp., Harvey, Ill., began his career as this firm's first "Co-Op" engineering apprentice. In 1924 he went into the engineering department as a draftsman and in 1927 was made engineering representative in the plant to coördinate engineering and manufacturing. His experience with welding has included a wide variety of heavy machinery such as overhead cranes, foundry equipment, railway equipment, chemical equipment, aviation equipment, etc. He is past chairman of the Chicago Section of AWS, past vice-chairman of the Mid-West Section of AWS and vice-president of the Chicago Technical Societies Council.

District Vice-Presidents

The three district vice-presidents elected this year are: G. O. Hoglund, Harry W. Pierce and Howard N. Simms. Mr. Hoglund has been affiliated with the Aluminum Company of America since 1928 and has since 1930 been in charge of the development of welding processes for aluminum. He has made many outstanding contributions to the resistance and arc techniques for welding aluminum and is also responsible for the initial work of the development of brazing processes for aluminum alloys. He has been very active in AWS affairs, serving as a member of the filler metal specification committee, chairman of the subcommittee on aluminum brazing and chairman of the Pittsburgh Section.

Harry W. Pierce has been with the New York Shipbuilding Corp. since 1930 as assistant general foreman, hull department; welding supervisor; welding engineer and, at present, assistant to the general manager. He has been principally occupied with welding developments in ship construction, including design, specifications, procedure control and training. He is chairman of the marine committee and of the technical activities committee of the AWS and served as chairman of the Philadelphia Section from 1942 to 1944.

Howard N. Simms is a metallurgist with Black, Sivalls & Bryson, Inc., manufacturer of tanks, separators, walkways and welded vessels. Mr. Simms has been active in the American Welding Society for the past several years and is a past chairman of the Oklahoma City Section.

Miller Memorial Medal

Each year the Samuel Wylie Miller Memorial Medal is awarded to the person judged most deserving for "conspicuous contributions to the advancements of the welding or cutting of metals." This year's recipient was James F. Lincoln, president of The Lincoln Electric Co., Cleveland. Few persons will quarrel with that choice, for Mr. Lincoln's contributions to the welding industry have been so numerous that it is impossible to list more than a fraction of them here.

Joining the Lincoln Electric Co. (a concern founded by his older brother James C. Lincoln) shortly after his graduation from Ohio State University, Mr. Lincoln brought about the development of the separately excited d-c welding generator with bucking series field and stabilizer in the arc circuit. This resulted in an arc characteristic which made it easy for an ordinary welding operator to learn how to weld. In the electrode field, he pioneered in the development, application and manufacture of shielded-arc electrodes.

Mr. Lincoln is the author of many scientific and technical articles and papers as well as several books, among which are "Intelligent Selfishness and Manufacturing" and "Lincoln's Incentive System." In recognition of his outstanding foresight and accomplishments in the field of arc welding, The James F. Lincoln Arc Welding Foundation was established at the close of 1936 by the board of directors of The Lincoln Electric Co.

This year's Lincoln Gold Medal went to H. E. Kennedy, an electrical engineer of Berkeley, Calif., for

L. W. Delhi, newly elected president, American Welding Society

Harold O. Hill, of Bethlehem Steel, becomes first vice-president

George N. Sieger, Detroit, was elected AWS second vice-president

his paper, "Some Causes of Brittle Failures in Welded Mild-Steel Structures." George G. Luther, Clarence G. Jackson and Carl E. Hartbower, U. S. Navy, received honorable mention for their paper, "A Review and Summary of Weldability Testing of Carbon and Low-Alloy Steels."

Mr. Kennedy is a research associate in engineering at the University of California. He is a co-inventor of the submerged-melt welding process and his varied interest have also extended into the fields of thermal controls, X-rays, egg fruit machiners, electric furnaces and Diesel engines. He is a member of Sigma Xi and Tau Beta Pi honor societies.

RWMA Prize Contest

Julius Heuschkel's paper on "Selecting Spot-Welding Schedules for Low-Carbon Steels" was selected for the $750 first prize in the 1946 prize contest of the Resistance Welder Manufacturers' Association. This is the prize that is offered annually to the author of the best paper received from an industrial source in which the major portion of the subject matter deals specifically with resistance welding.* Mr. Heuschkel is a research engineer at the Westinghouse Research Laboratories, East Pittsburgh. He is the author of the article, "Effects of Current Shunting on Spot Welds," appearing in this issue of The Welding Engineer.

Joseph J. Riley, sales engineer of The Taylor-Winfield Corp., was awarded the $500 prize for the second best paper from an industrial source for his paper, "Vibration of Spot Welds in Low-Carbon Steel over a Range of Welding Variables." Mr. Riley spent four years on resistance-welding problems in the laboratory of Taylor-Winfield and has written several other technical papers on resistance welding. He has also served as a member of several AWS committees.

R. W. Bennett and R. D. Williams were awarded third prize of $250 for the third best paper emanating from an industrial source.

The author of the best paper emanating from a university source was judged to be the team of Robert C. McMaster and Nicholas Begovitch, who received the $300 prize for their paper on "Instrumentation of the Spot Welder and Investigation of the Spot Welding of 0.091-in. to 0.091-in. 24St Alclad Sheet." Mr. McMaster is now assistant research supervisor in the industrial physics division of Battelle Memorial Institute, Columbus, O. During the war period, however, he supervised aircraft welding and X-ray research projects at California Institute of Technology, which brought him into contact with Mr. Begovich, who is now teaching in the electrical engineering department. Mr. Begovich has developed a new method of measuring the pulse currents that occur in discharge types of spot welders. He has also designed apparatus which has given for the first time photographic records of the instantaneous forces involved in metal cutting.

Julius Heuschkel, Westinghouse, wrote the industrial paper that won first prize in the RWMA contest

The second prize of $200 for a resistance-welding paper from a university source went to W. F. Hess, W. D. Doty and W. H. Childs for their paper, "The Spot Welding of NE 8715, NE 8630 and SAE 4340 in the 0.125-in. Thickness." Dr. Hess is professor in metallurgical engineering and head of the welding laboratory of Rensselaer Polytechnic Institute, Troy, N. Y. He served as national president of the American Welding Society for the 1945–46 term and has held the additional offices of chairman of the Northern New York Section; district vice-president, New York and New England district; chairman, committee on awards; chairman, educational committee. In October, 1944, he was awarded the Lincoln Gold Medal by the American Welding Society and the university award of the Resistance Welder Manufacturers Association; in July, 1945, he was awarded the American Iron and Steel Institute Medal for 1944.

Dr. Doty has served as a research fellow on the staff of the welding laboratory of Rensselaer Polytechnic Institute and has been associated with various projects dealing with the spot welding of armor plate, thin-gauge hardenable steels and nickel alloys. He is a member of the American Welding Society and has been co-author of many papers on resistance welding.

Mr. Childs has been associated with the welding laboratory of Rensselaer since his graduation in 1945. He has worked on the spot welding of armor plate and hardenable steels and is presently engaged in an investigation of the fundamentals of projection welding.

A. F. Davis Award

As authors of the best paper on welding to be published in an undergraduate magazine, Stephen T. Mickochik and Joseph S. Ward, Jr., were awarded the first prize of $200 and a certificate in the 1946 A. F. Davis Undergraduate Welding Award Program. Their paper, "Welding in Bridges," was published in the June, 1946, issue of the *Manhattan Engineer*, the magazine of the School of Engineering, Manhattan College. The magazine was also awarded a first prize of $200 and a certificate as publisher of the prize-winning paper. Mr. Mickochik, who graduated from Manhattan College in June of this year, is now working for his Master of Science degree at Rutgers University. Mr. Ward is a graduate assistant at Rutgers University, where he is also working for a Master of Science degree.

Effects of Current Shunting On Spot Welds

★ OPERATION

Conclusions based upon the test properties of single welds are all too often misleading and often of little value to the men on the production line, regardless of how uniform or consistent the results may be.

BY JULIUS HEUSCHKEL
Research Engineer, Welding Section, Westinghouse Research Laboratories

ALL users of spot welding, and particularly newcomers, should recognize that production welding schedules must be established from the viewpoint of overall product requirements. If welds on the heavy-gauge material are made too closely together, or if for a required spacing an inadequate schedule is used, sufficient current will by-pass through the adjacent welds (previously made) to form undersize nuggets. The result is an inferior product. In extreme cases, two spot welds can be made with a combined strength less than that of one weld alone.

The test results presented in this article reemphasize the possible significance of permitting the production use of uncompensated current shunting. The data were obtained from welds and joints in ¼-in. plain-carbon steel.

The seven specimens shown in Fig. 1 were all made within the same time interval with the same force on the same machine, using the different heat control settings that are listed beside each weld fracture (inside). The higher the heat control setting, the higher the secondary current used. Total strengths in pounds are given by

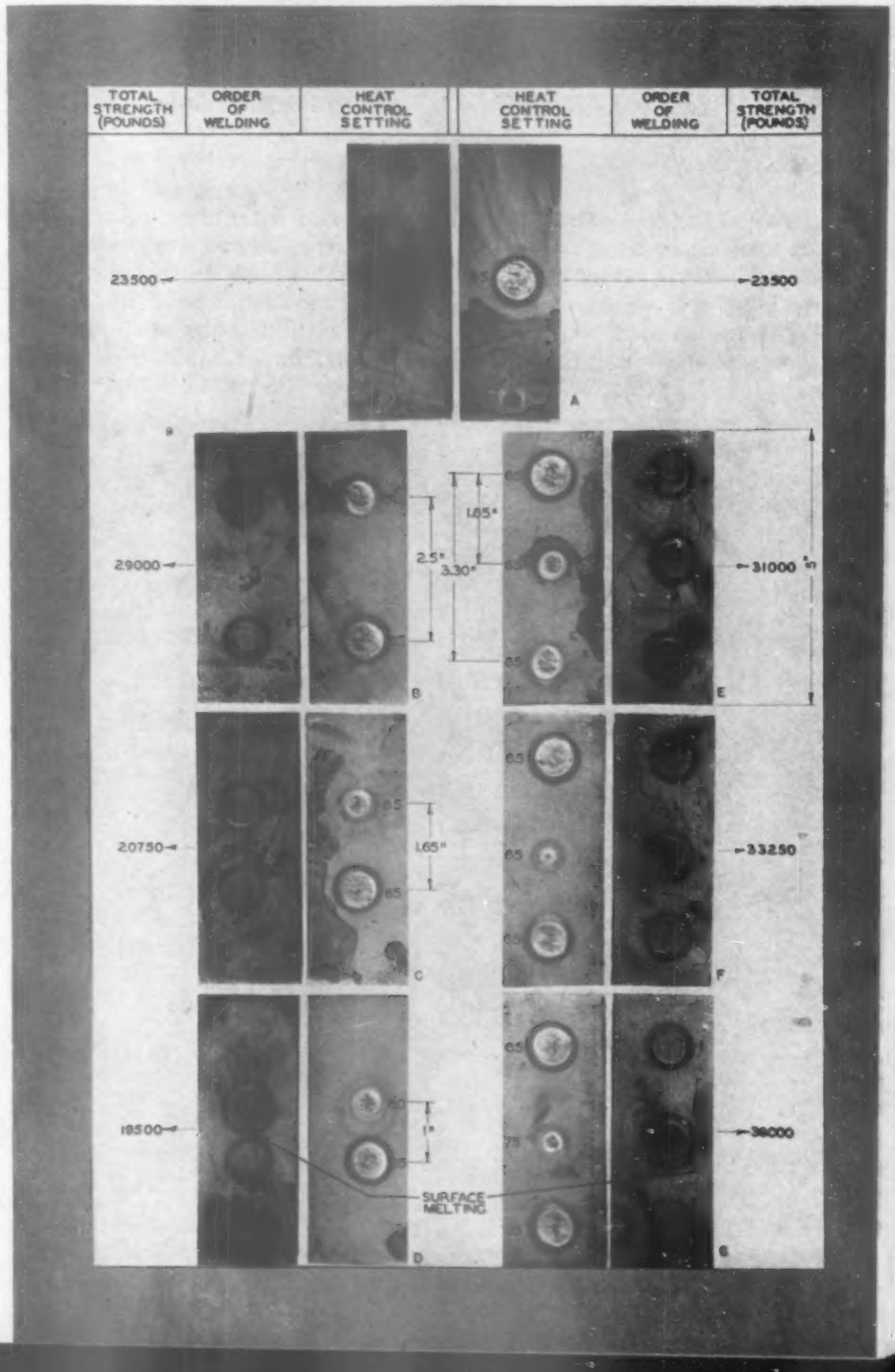


Fig. 1—Shear specimens in ¼-in. plate of welds made with a single 60-cycle impulse. Figures at extreme right and left indicate total shear strengths in lb; those inside current settings. The "1, 2, 3" on a specimen gives order in which welds were made

the outside figures beside the specimens. All welds in this series were made with a single impulse of 60 cycles (1 second) duration. All of the specimens were 5 in. wide.

The ultimate tension-shear strength of a single weld, 23,500 lb, should be representative of each symmetrically loaded first weld made in each of the other six specimens in this series. The appearance of both the external surface and the fracture of a single weld is shown in the top illustration. On the basis of the shear strength alone, this weld would very commonly be classified as commercially acceptable, and, unfortunately, the welding schedule might also be considered suitable in some shops. The operator, supervisor, engineer or inspector could very honestly have substantiating data to prove that the set-up used was satisfactory. For individual welds *had* been made, and the test data *was* indisputably well above the required strength values. But let us suppose that such a schedule is used in production without a further check-up.

The results that were obtained from a series of six specimens (B to G), welded in the various orders as numbered, are also shown in Figure 1. In the second weld of specimen D the secondary current was increased beyond the point where actual surface melting of the steel occurred. From external appearances alone, this second weld would be classified as being on the "hot" side. Actually, the weld ingot was small in size.

Second Weld Reduces Strength

The total strength obtained from each of the two weld specimens, C and D, was less than that obtained from the single weld in specimen A. Failure in both of these specimens occurred first in the number two (smaller) weld and progressed with combined tension-shear-impact and torsion-impact to weld number one without opportunity for a further increase in total load, partially due to the resulting eccentricity. Though the spacings of these welds (1.65 and 1 in.) are extreme examples, they serve very nicely to illustrate what would happen should these combinations of uncompensated conditions be used on a lifting lug, for example, where total strength with an adequate factor of safety is important.

The three-weld specimens, E, F and G, all developed somewhat higher total strengths, but in no case was the joint strength equal to even twice that of a single weld specimen. It is again significant that the lowest strength was obtained from specimen E, where the number three (smaller) weld was located at the outer edge. In specimens F and G, due to the order of welding used, a double shunting effect occurred during the formation of the number three weld; better total strengths were obtained in these specimens because the number two weld was made at a spacing more nearly in accordance with the limitations of the schedule used and consequently a more nearly symmetrical specimen was obtained. When the small center or closing welds failed at low loads, an approximately even distribution occurred between the remaining two larger outer welds. Since these were more nearly of the same size, the final total load on the joint more nearly approached twice that of the single first weld. The center nuggets neither add to nor subtract from the total strengths of the joints, and the making of these welds was simply a waste of time.

What These Tests Show

This series of tests, Fig. 1, is believed to illustrate the following principles:

1. The internal character of a spot weld cannot necessarily be judged from external appearances.
2. The strength of a spot-welded joint is often determined by the strength of the weakest outer weld

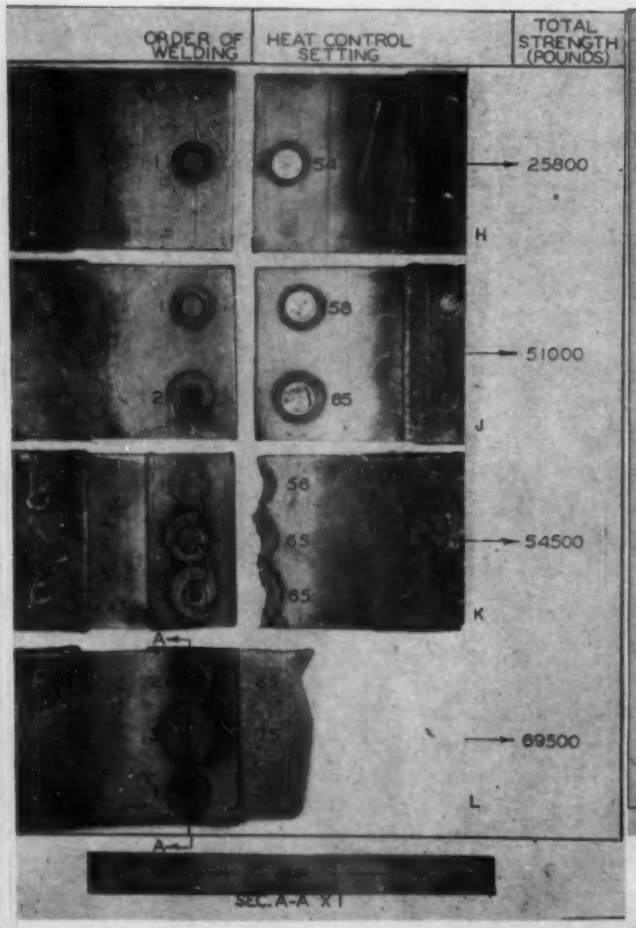


Fig. 2 (left)—Shear specimens with welds of three impulses of 51 cycles in the same material used for Fig. 1. Note the differences in strengths of two- weld and three-weld specimens

Fig. 3—Test specimen, 12 in. wide, ¼ in. thick, having a joint formed by a row of seven single-impulse welds. The strength of individual welds averaged 33,000 lb, and the joint developed the full tensile strength of the unwelded plate (48,100 psi)

in the row. Symmetry of weld size across the width of the joint is thus of fundamental importance.

3. It may be dangerously misleading to judge the suitability of production spot-welding schedules solely on the performance of single-weld specimens.

4. Total joint strength cannot be determined by simply multiplying the number of welds by either the average or minimum strength per weld; it is necessary to consider the distribution of the non-uniformities.

Pulsation-Welded Specimens

A second series of specimens was made using the same lot of material with a pulsation-welding schedule. A somewhat lesser secondary current was used, together with a longer total weld time. The weld period was divided into three impulses with a 20% cool time. The same tips and electrode force were also used.

The results of these tests are shown in Fig. 2. The strength of the single first weld (again shown at the top of the group) is about the same as that obtained in the first series of tests. But the two-weld specimen developed approximately twice the strength of the single-weld specimen, as should be the case provided the specimen is sufficiently wide. Both of the three-weld specimens developed strengths approximating that of the full strength of the unwelded plate. The strength of the K specimen was somewhat impaired by an undersized number three weld, again located at the outer end of the row. The L specimen failed in the plate at an average stress of 55,500 psi. The tip-force-current-time combination used in these specimens is not intended to be illustrative of optimum conditions, but the contrast in the results with those obtained in the first series is startling. It tends to prove our point that once a correct schedule from the point of view of the overall joint has been established the production of whatever quality of product is required becomes a matter of uniformity, control and inspection.

Fig. 3 presents the results obtained with a third welding procedure involving only one impulse per weld. The test specimen was a 12-in. wide, seven-weld joint in a softer (tensile strength 48,100 psi) lot of ¼-in. low-carbon steel. The full strength of the unwelded plate was developed. The individual weld shear strength in this instance was 33,000 lb. This schedule, therefore, is representative of the opposite extreme from that employed in the first series.

This specimen well indicates what can be done with a single row of welds in material of this thickness and strength. In some instances, however, it may be both necessary and desirable to use multiple rows of spot welds.

Fig. 3 is not a fluke or a special case. Full-strength joints with a single row of spot welds have been produced across the entire range of thicknesses, up to and including ¼ in., using specimens like the one shown in Fig. 4. In no case was it necessary to space the spot welds edge to edge in order to obtain the full strengths of the base metal.

The data we have presented show that the practically complete correction of shunting losses permits use of the close spacings required for the production of high-strength joints. Let us now point out some of the pitfalls which the welding supervisor or engineer must avoid and which the welding inspector must be able to detect.

Spacing Not the Only Factor

The tendency is for shunting losses to become less serious on the thinner sheets, more serious on thicker plates. Weld spacing alone is not the only factor involved. For any given plate thickness, the question of whether or not shunting losses will be serious depends as much upon the specific welding schedule used as upon the spacing. A spacing suitable for one schedule may be wholly unsuitable for a different schedule. Bear in mind that design factors sometimes dictate that the closer spacings must be used for the production of high-strength joints or connections.

Possible corrections through the increase of secondary current alone

Fig. 4—Another 12-in. test specimen with a joint formed by a row of ten spot welds. Close spacings are often necessary for the production of high-strength joints

are definitely limited. A more satisfactory approach, perhaps, is to increase the welding time or the number of pulsations when pulsation welding is used. In either event, the current must be selected so that neither internal expulsion nor surface melting is obtained. The use of too low pressures seriously restricts the possibilities of corrections through the use of increased secondary currents and may require the use of excessively long welding times when close spacings are necessary. This in turn may reduce the overall production speed to a prohibitive extent.

The production of spot-welded parts of high quality is a matter of obtaining a balance between the use of proper designs, suitable materials, correct schedules, adequate equipment, competent operators, intelligent supervision and searching inspection. This entire chain must be adjusted to fit the specific known requirements of the product as a whole.

★ PRODUCTION

Tomorrow's Kitchen Today

Fig. 1—Welding stainless-steel cabinet sinks at Elkay Manufacturing Co., Chicago. All welds are downhand

BY R. G. SWISHER

For many years stainless steel has been recognized as one of the most sanitary of all metals. Its easy-to-clean-and-keep-clean surface resists acids and rust, protecting food against contamination. Now it is being applied to welded sinks for home kitchens.

THE KITCHEN OF TOMORROW will be the show place of the home, the old ugly duckling transformed into a beautiful swan. Its unsightly exposed plumbing will be completely hidden; its old water-and-grease-soaked drainboards and work tables replaced by shimmering stainless steel. Tomorrow's kitchen will be a masterpiece of efficiency, utility and beauty.

The known sanitary advantages of stainless steel are being featured on welded kitchen sinks manufactured by The Elkay Manufacturing Co., 1874 S. 54th Ave., Chicago 50. The Elkay "Sturdibilt" stainless cabinet sink has no seams nor joints to come apart, no overlapping flanges to permit water or juices from fruit, meats or vegetables to seep through and weaken the supporting structure or flow into the cabinet drawers, no crevices where particles of food can lodge and decay to provide breeding places for germs. Its sturdy, one-piece construction should last a lifetime.

Elkay has a planning service, based on a quarter of a century of business experience, which enables the architect or contractor to offer his clients the type of stainless steel sinks and tops that embody the latest ideas in symmetry of design, individual character, beauty, efficiency and general utility. All Elkay "Sturdibilt" products are custom-built to architects' plans.

Cabinet sinks are fabricated from a clad steel that consists of a layer of 18-gauge (0.050 in.) 18-8 stainless bonded to a 14-gauge (0.078 in.) thickness of mild steel. After the components have been cut, the sinks are welded together as shown in Fig. 1.

Work from Blueprints

The weldors at Elkay are experts in the fabrication of stainless steel. Each man who welds cabinet sinks is furnished with a full set of blueprints and a data sheet. The blueprints must be followed faithfully since the sinks are seldom alike and the procedure in fabrication differs from one sink to another.

In order to obtain good, smooth weld seams, the sinks are positioned so that all welding can be done in the downhand position (Fig. 1). The sink bowl is tacked into place with a carbon arc before welding, and the edges are hammered all over to assure good fit-up for the butt weld. Warping is minimized by the use of copper bars placed in back of the edges to be welded.

The metal tops are reinforced with heavy longitudinal Z-shaped stiffeners as shown in Fig. 4. These are spot welded to the steel base and run the full length of the drainboard. Wood strips are provided for fastening the top to the cabinet. Drainboards, rims and backs are made integral of one sheet of metal. Sink bowls are butt welded integral to drainboards, presenting an invisible flush-ground seam. No overlapping or soldered edges are permitted. Edges where sink bowls and drainboards meet are rounded to ¼-in. radius to eliminate sharp right angles. Intersections where back splasher meets return end splashers are also rounded to ¼-in. radius. The thickness of the back is not less than 1½-in. (reduced to 1 in. when deck-type faucets are used). The distance from the inside of the sink bowl to the outer edge of the front rim is 2½ in.

Drainboards are pitched to the sink bowl by means of an offset forming that provides a drain ledge at both front and back. All

Fig. 2—Welding galvanized scullery sinks. All welds are made with bare electrodes to avoid slag inclusions

Fig. 3—Polishing department. Stainless steel and Monel sinks are undergoing their final stages of polishing

corners of sink bowls (horizontal, lateral and vertical) are rounded to 1¾-in. radius. All 18-8 stainless-steel surfaces are number 4 satin finished, in the manner shown in Fig. 3. The underside of the entire sink top and bowl are sound deadened with insulating material.

Galvanized Scullery Sinks

Scullery sinks are made of either stainless steel or of mild steel hot-dip-galvanized after fabrication. The galvanized sinks are made of 12-gauge (0.1094 in.) steel, all-welded construction with rolled rims. Front, bottom and back are each made of a single sheet of metal, and the ends, partitions and drainboards are welded into place as shown in Fig. 2. Bare electrodes are used to prevent the possibility of slag inclusion in the welded seams since slag would repel the galvanizing and leave a bare spot to rust.

Construction details are shown in Fig. 5. The sink compartment is pitched to the drain. The sink is supported on 2 by 2 by ⅛ in. angles with gussets. The legs are detachable and arranged with an adjusting bolt, which serves both to anchor the legs and to level the sink. The sink is made to set 36 in. from the floor to rim and is drilled for faucets, wastes and overflows as specified.

Stainless-steel scullery sinks are made of 14-gauge (0.0781 in.) 18-8 stainless steel. Front, bottom and back are made of one piece of metal, with ends, partitions and integral pitched drainboards welded in. Welded joints are ground and polished to blend with the sink body, which is finished with No. 4 satin polish on upper surfaces and No. 3 brush finish on exposed surfaces below the rim. The sink compartment is pitched to drain. The sinks are supported on detachable legs made of 2 by 2 in., 14-gauge stainless-steel angles with gussets. The legs are arranged with an adjusting bolt. The sink is made to set 36 in. from floor to rim and is drilled for faucets, etc.

Welding facilities of the Elkay Manufacturing Co. include arc, oxy-acetylene and resistance welding. The joints of parts that are to withstand weight in use, cabinet sink tops, for instance, are butt welded by the arc-welding process; this applies also to joints on stainless steel and hot-galvanized scullery sinks. Many products such as Monel metal lavatories are silver brazed with the oxy-acetylene torch. Resistance welding is used mainly for spot welding the heavy longitudinal steel stiffeners.

Fig. 4—Cutaway view of the top and the bottom of a stainless-steel cabinet sink showing how heavy longitudinal Z-shaped stiffeners are spot welded

Photographs and sketch, courtesy The Hobart Brothers Co.

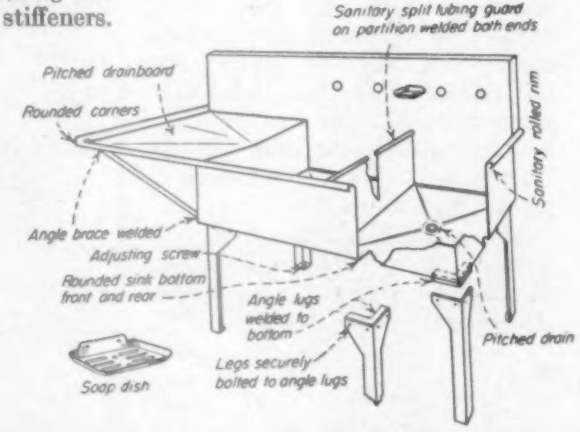


Fig. 5—Construction features of both hot-galvanized and stainless-steel scullery sinks

★MAINTENANCE

Welding Small Cables for Conveyors

BY H. W. YOUNG

Fig. 1—One end of the cable is seized in this simple clamp while the strands are welded into a solid mass

Fig. 2—This clamp is used in the field to hold the two ends of the cable in alignment for silver brazing

ONE STAGE in the manufacture of plywood calls for the conveying of the wide sheets of wood as they come from the peelers through a long assembly machine. The conveyors for this are usually of the chain type, but chain was unavailable under present conditions. Welding and brazing, however, made it possible to substitute ½-in. steel stranded cable for the various continuous conveyor loops.

JOINTS WITHOUT ENLARGEMENT

The Western Machinery Corp., Portland, Ore., undertook to furnish these cable conveyors. The chief difficulty in the use of stranded cable was, of course, the joining of the cable ends. Shop Superintendent Ardies, Welding Superintendent Crumley and their associates at Western Machinery devised a unique method of welding and brazing the ends so as to make the cables continuous. The joints were made without any enlargement, permitting the cable loop to travel easily over the smallest sheave, which is of 2-in. diam.

The method necessitated two special clamps or holders, shown in the accompanying pictures. These clamps were hand made for the particular job, but in principle they can be applied to the welding of small cables for any purpose.

First, the cable is cut to the desired length. One end is seized in the clamp shown in Fig. 1, and the ends of the strands are filed off smooth and flush with the clamp jaws. The jaws are now loosened to enable the cable end to be advanced through the clamp until it protrudes 1/16 in. The protruding end is welded into one solid mass by means of an oxy-acetylene torch. No metal is added; the strands are simply fused together.

> Conveyor chains were unavailable, so it was decided to use steel stranded cable. Then came the big question: how could the ends be joined to make a continuous loop that would travel smoothly over the sheaves?

The welded end is filed flat, after which it is tinned with silver.

The same process is followed with regard to the other end.

ENDS SILVER BRAZED

The next step must be taken in the field, for the steel cable cannot be slipped on the sheaves as a belt would be but must be first threaded deviously through the machine before the ends can be brought together and made continuous. For this step, another type of clamp was designed, as shown in Fig. 2.

This small-size clamp can easily be carried about on the job. It has two pairs of jaws, one pair to seize each end of the cable. The clamp holds the abutting cable ends in perfect alignment for silver brazing.

When the job is completed by silver brazing the two ends together, the whole joint does not exceed 3/16 in. in length and is no larger around than the outsider diameter of the cable proper. The brazed cable will travel around the smallest sheave, and even after a considerable time in operation there has been no evidence of undue wear at the joints, nor any loosening of the strands.

★ CONSTRUCTION

Welding German U-Boats*

This military evaluation report discloses the methods and welding sequences used at a German shipyard to build the late type XXI U-boats. Prefabricated sections were employed, and eight weldors worked at once on a circumential seam.

WELDING methods employed in German U-boat construction did not differ greatly from ship construction in the United States. According to information military authorities obtained from an interview with Herr Holland, the welding engineer at Germania Werke, Kiel, prefabricated sections were assembled by beginning with the middle and working outwardly towards the ends. This was the same end-to-middle sequence developed for the assembly of tankers at Henry J. Kaiser's Swan Island yard†.

Only d-c welding was used at the Germania Werke.

TYPE VII C U-BOATS

Experience of the welding of prefabricated sections of U-boats was obtained in the first place with Type VII C. The prefabricated sections were made at the yard, and they were of circular sections; the keel bulge was welded on after the joining of the circular sections. The steel used for this type of submarine was said to average the following composition: carbon, 0.2%; silicon, 0.55%; manganese, 0.4%.

Normal mild-steel electrodes were used for all welds, and no difficulties were encountered. Nevertheless, experience showed it to be desirable to start from the middle section and work outwards towards the two ends. In making the circumferential welds between sections, it was found to be desirable to employ four weldors continuously, and this technique minimized distortion and obviated all cracking due to locked-up stresses.

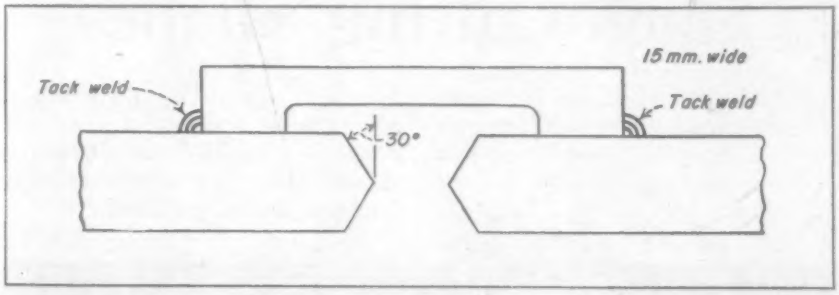


Fig. 1—Tack-welded spacers were sometimes used to hold adjacent prefabricateds ections in position for welding. This shows the general method

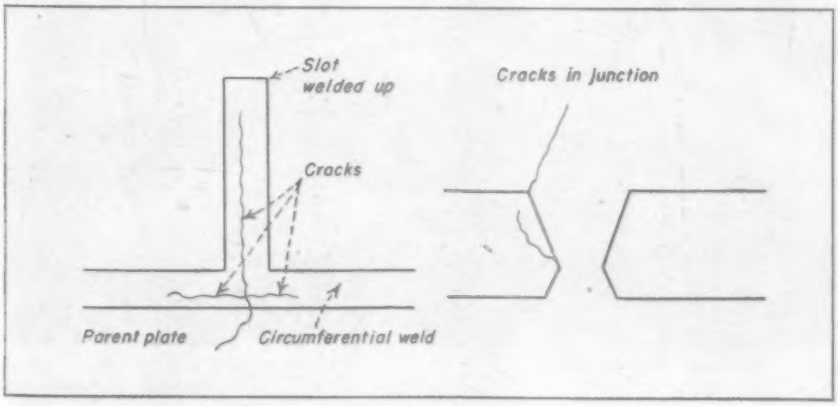


Fig. 2—Types of cracks observed in the weld metal and parent plates

TYPE XXI U-BOATS

The steel used for this class of submarine was said to average the following composition: carbon 0.29-0.32%; silicon, 1.0%; manganese, 0.35%.

This steel is of considerably higher carbon content and tensile strength than that used for Type VII C. In view of the high-silicon content, the mild-steel electrodes used for Type VII C submarines were found to be unsuitable, especially for the circumferential welds.

At the beginning of the program, austenitic or ferritic electrodes were used for the circumferential welds, but shortages necessitated the supplementary employment of mild-steel electrodes with an extra thick flux coating. At a later stage very low-carbon steels (about 0.05% C) were used as the ferritic electrodes; this material, approximating to Arnco iron, would have a low yield

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*From a technical report published by the Office of Publication Board, U. S. Department of Commerce.

†"Welding Sequence at Swan Island," THE WELDING ENGINEER, May and June, 1946.

point and would be expected to minimize any cracking.

Welding the Sections

All sections for Type XXI U-boats were manufactured by outside contractors and different methods were used. On the whole, most contractors employed manual welding throughout, but a few employed automatic welding methods such as the submerged-melt process for plate butt welds.

As with Type VII C submarines, welding was commenced from the middle section and then extended outwards uniformly towards the two ends. Work was speeded up slightly at the after end of the submarine to permit the installation of the engines at the earliest date. Eight weldors were employed on each main circumferential weld, and this usually permitted the weld to be completed in one day's work. As the eight weldors operated at equidistant points around the circumference, many of the troubles due to distortion or cracking were avoided.

Two different methods were employed to position adjacent prefabricated sections for welding:

(1) By clamps.

(2) By tack-welded spacers as shown in Fig. 1.

The joining of sections 5 and 6, which were of different sizes, required rather different treatment. The recommended method was to machine slots 300 cm (9 ft., 10 in.) long and the thickness of the plate at twelve points around the circumference and then expand the plate by a pressing operation until the cross-section of 5 equalled that of 6. The slots were then closed by welding before the circumferential joint was made.

Some troubles were associated with this method of fabrication. Cracking was in general confined to two particular areas. The types of cracks observed were always brittle and had obviously been formed under conditions of triaxial stress. The positions particularly liable to crack in this manner were:

(1) At the junction of sections 5 and 6 and particularly in the weld metal used to close the slots. These cracks were often up to 100–150 cm (39–59 in.) long, and they occasionally extended into the parent plates. Sketches illustrating the types of cracks observed are shown in Fig. 2.

Cracks in this position were only obtained when mild-steel electrodes were employed, and the use of austenitic or ferritic electrodes overcame in a very large measure this form of trouble.

(2) Three or four of the U-boat prefabricated sections have an internal stiffener, and such sections were the source of a lot of cracking when making the circumferential welds. This position and the welding sequence which was found to be the most satisfactory are illustrated in Fig. 3.

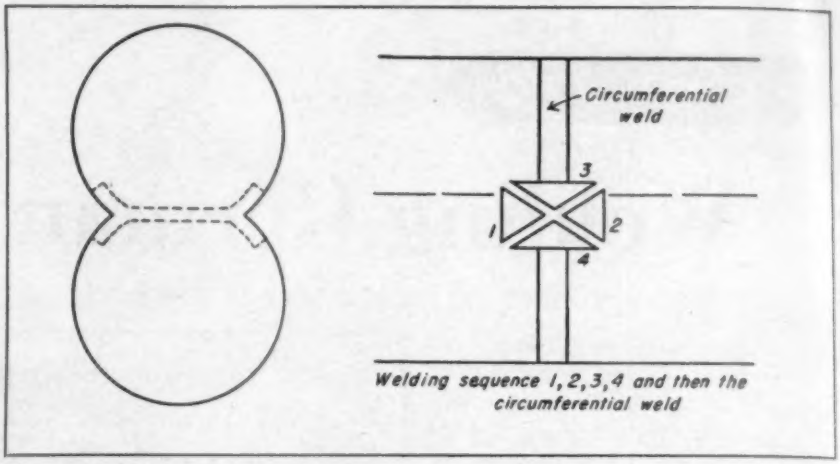


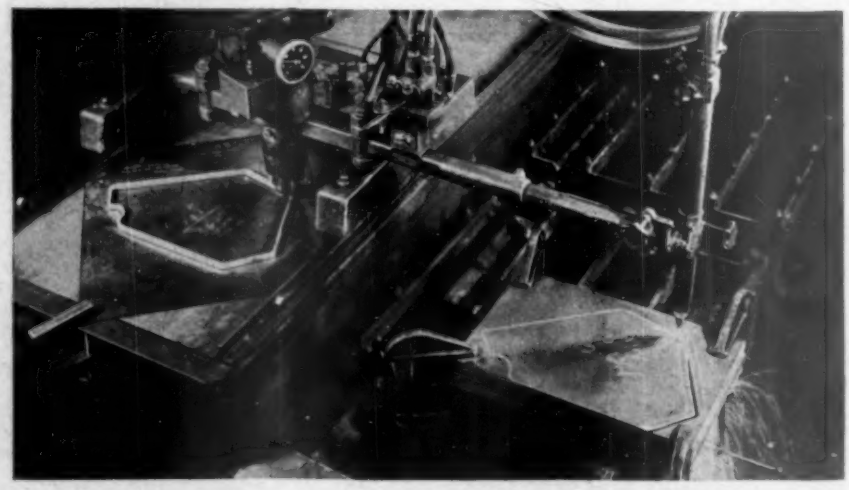
Fig. 3—This lateral stiffener and the sequence (1, 2, etc.) were found to be most satisfactory for circumferential welds in prefabricated sections

A total of 25% of the length of all pressure hull welds was examined by X-rays. All cracks, whether in weld metal or parent plate, were vee-cut and rewelded using austenitic electrodes. All such repair welds were subsequently X-rayed.

☆ ☆

Stack-Cutting Shapes

Stack-cutting with a template-guided torch set-up has become a popular production method for irregular flat shapes. In the illustration below, 14 pieces of 3/16-in. steel plate are being cut at one time at a speed of 7 in. per minute. The plates are clamped as shown, while an aluminum-strip template guides the torch.



The Linde Air Products Co.

Fourteen pieces of 3/16-in. plate are being cut simultaneously by this method

★ RESEARCH

Soldering and Brazing of Stainless-Steel Piping

BY ERIC R. SEABLOOM, *Supervising Engineer, Crane Co. Research Laboratories*

Here is Mr. Seabloom's final article in the "Alloy-Steel Piping" series. It tells you what solders, brazing alloys and fluxes to use to join stainless tubing and fittings.

A series of three articles was published in the September, October and November issues of THE WELDING ENGINEER *under the title, "Welding Methods for Alloy-Steel Piping." These covered welding, preheats, heat treatments and metallurgical characteristics of chromium-molybdenum, straight-chromium and chromium-nickel steels.*

Soldering and brazing are also used quite extensively for joining chromium-nickel stainless-steel tubing where elevated temperatures are not encountered or high-strength joints are not required. Mr. Seabloom's last article deals with the techniques of making capillary soldered and brazed joints on stainless alloys. As in welding, certain precautions must be observed to produce satisfactory joints and also to avoid carbide precipitation with resultant intergranular corrosion.—THE EDITORS

Fig. 1—An example of soldered joints. This complex object is a stainless-steel coil that provides sanitary piping for a milk plant

SEVERAL grades of chromium-nickel stainless steels are used extensively in the food industries for handling such media as milk, milk products, lactic and butyric acids, fruit juices, vegetable juices, vinegar and practically all cooked or prepared food products. Fig. 1 shows an example of sanitary piping. These piping systems must be demountable for easy handling and cleaning; consequently, lightweight tubing is employed in relatively short lengths with stainless-steel fittings, unions and union fittings (as shown in Fig. 2) to facilitate dismantling and reassembly. Since the requirements of sanitary piping demand that joints be designed to eliminate food pockets so that contamination cannot occur, solder joints similar to those in Fig. 3 are often employed between tubing and fittings or union connections. Often stainless piping is used in the drug, soap, cosmetics and other chemical industries, although here heavier types of standard fittings may sometimes be utilized.

There are many grades of soft solders and silver solders available—listed by ASTM Specifications B32-40T and B73-29—as well as some proprietary silver-brazing alloys. Only a few of these, however, are used to any extent in the joining of stainless-steel piping.

Soft Solders and Fluxes

The most widely used soft solders are tabulated in Table I with their compositions, melting ranges and recommended service temperatures.

Joints between stainless tubing and fittings are most readily made with the 50-50 tin-lead or 60-40 tin-lead solders. Many health authorities, however, prohibit the use of solders containing substantial quantities of lead on piping carrying food products, even though the amount of solder exposed to the fluid in a capillary type of joint is negligible. Solder joints with sanitary fittings are, therefore, most frequently made up of pure tin. The 95-5 tin-lead and the 95-5 tin-antimony solders are also employed occasionally.

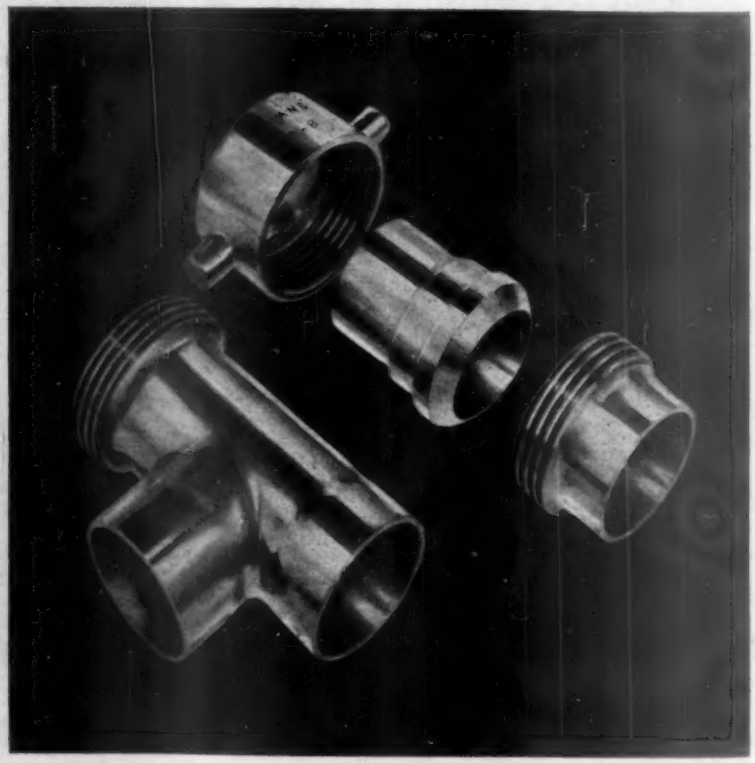
With all of these solders, including pure tin, it is necessary to use suitable fluxes to (1) prevent oxidation of the surfaces to be joined, (2) dissolve the oxides that form while heating and (3) aid the flow of solder. While the zinc chloride-ammonium chloride flux usually employed in general soldering will give a fair degree of success, it is better to prepare a stronger flux by mixing two-thirds "zinc cut" muriatic (hydrochloric) acid with one-third raw or uncut muriatic acid. A stronger flux than for general soldering is required with stainless steel because of the chromium oxide which forms when heating. Several proprietary soft soldering fluxes are on the market, and these are generally preferred for stainless.

In making tube-to-fitting joints, it is very essential for best results to clean thoroughly with emery cloth the outside area of the tube and also the bore of the fitting. It is then necessary to tin both surfaces prior to the final soldering assembly. This can be accomplished in two ways.

The first method is to brush flux on the surfaces, including the end

Fig. 2—Soldered joints between stainless tubing and fittings. Union connections provide quick dismantling and cleaning

Fig. 3—Types of fittings employed in making solder joints on sanitary piping. The ends are bored with a shoulder that matches the inside tubing diameter to prevent food pockets



of the tube and the edge of the fitting. The outside and inside surfaces are then tinned with a soldering iron, preferably one which has a convex-concave copper to give better contact with the curved surfaces. Since the tube can be only partially inserted into the fitting after tinning, it is advisable to prepare the final assembly in the vertical position. Heat is now applied to the fitting and tube by means of an oxy-acetylene or air-acetylene torch (avoid a direct flame on the tinned surfaces) until the solder melts and the tube slips into the bore of the fitting. While the solder is still molten, additional solder is fed around the edge of the fitting to assure a complete filling and build up a slight fillet.

The four illustrations in Fig. 4 depict various steps in making a soldered joint by this method. First the outside of the tube and the inside of the fitting are cleaned with emery cloth as in (A). Flux is applied to both tube and fitting (B). The outside of the tube and the inside of the fitting are tinned (C). Finally the tube is inserted in the fitting, and heat from a torch is applied to the tube until the solder melts, while additional solder is being fed around the edge of the fitting (D).

Molten Solder Bath

The other method of tinning and joining is to flux the tube and fitting, then dip them into a pot of molten solder until the parts reach the temperature of the bath. Both parts need not be heated simultaneously. Upon removal from the bath, incomplete tinning may be encountered. Brush on flux again, and return the part immediately to the molten solder bath, holding it there until the solder adheres to the surfaces. If tinning is still not complete, repeat the fluxing and heating operations. When both parts are completely tinned, hold them in the bath until the melting point of the solder is reached, then remove and insert the tube into the fitting. Additional heat may be applied with a torch, and solder fed around the edge of the fitting as previously described.

Since fluxes are necessarily corrosive, it is essential to remove all

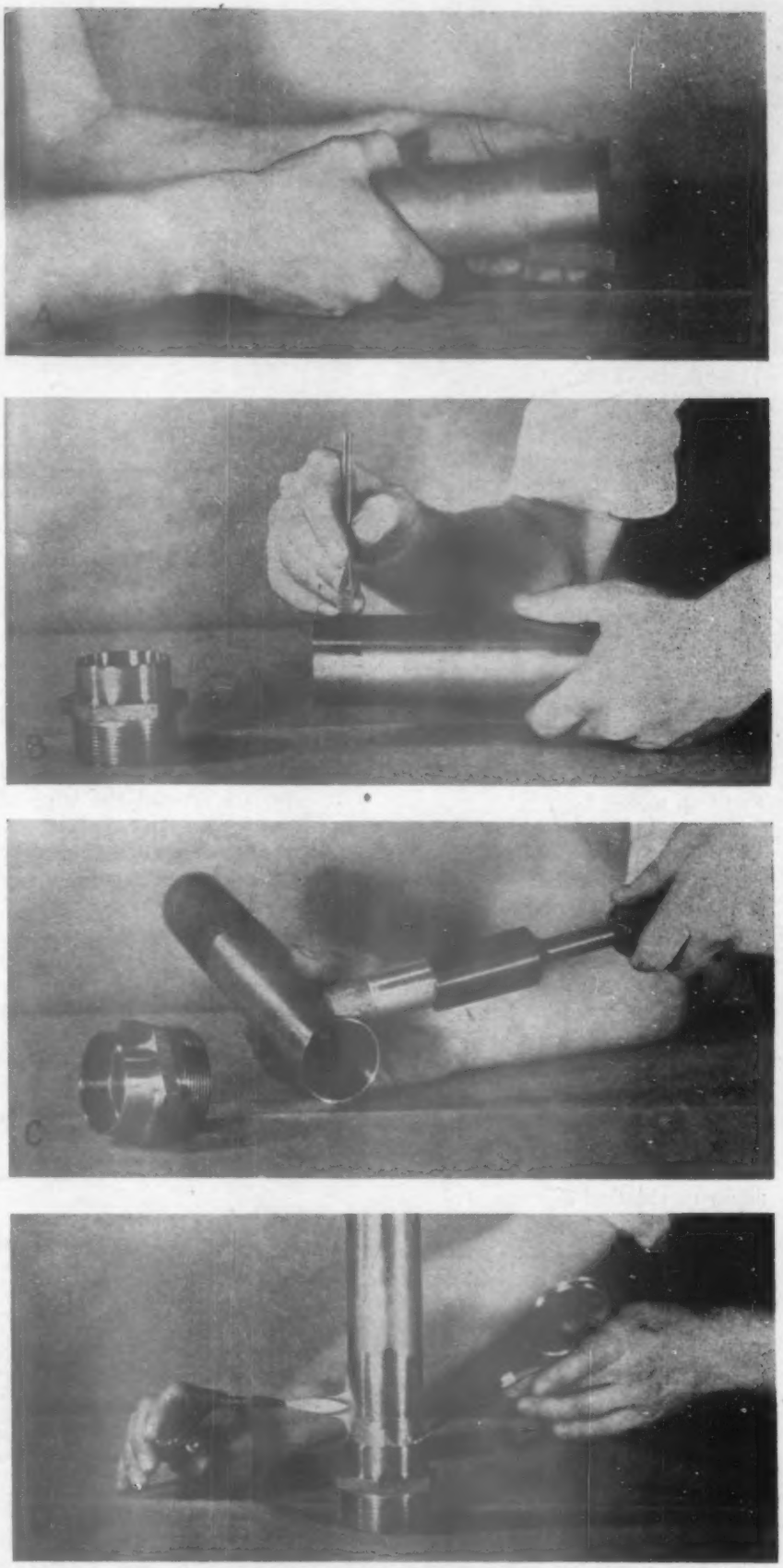


Fig. 4—Four of the steps in making a solder joint. (A) Cleaning the outside of the tube with emery cloth, (B) applying flux, (C) tinning the outside of the tube, (D) applying torch to melt the solder while feeding additional solder around the edge of the fitting

traces of them after soldering. This can be done by thoroughly wiping or rinsing the assembly in hot water, a water-soap solution or a dilute mixture of ammonia and water.

Silver Alloys and Fluxes

Brazed joints are also made between stainless tubing and fittings by employing silver-brazing alloys. A number of standard silver solders or brazing alloys are listed in ASTM Specification B73-29, but since their melting points range from 1,250 to 1,600 F, some of the proprietary alloys having lower melting temperatures are more popular. The chemical compositions and melting ranges of two such alloys are given in Table II.

When severe corrosive conditions are encountered, such as with chloride solutions, the alloy containing nickel is recommended. Both alloys display high strength when proper joint clearances are provided, and they can be used to join piping operating at temperatures up to 550 F.

In making silver-brazed joints, two types of fittings are generally employed: those that require outside feed and those with reservoirs for the brazing alloy inside the fitting bores. With either type, it is necessary to thoroughly clean the bores and the tubes with emery cloth prior to fluxing.

The temperature required for silver brazing causes a refractory chromium oxide to form on heated surfaces. Hence a flux must be used that will give protection against oxidation and dissolve the oxides that do form while aiding the flow of the brazing alloy. The more common boric acid-borax fluxes give fair results, but it is best to employ a flux having a potassium fluoride base. Such a flux comes in the form of a paste that starts to liquify at 900 F and is very active at 1,200 F. This flux should be thinned with water to the desired consistency and brushed onto the surfaces to be joined, including the brazing alloy.

After the tube has been inserted into the fitting, heat is applied to both parts, preferably with an oxy-acetylene torch. When larger sizes of tubing are being handled, a multi-tip torch will give the best results. When plain fittings are used, the brazing alloy is fed into the joint around the edge until the capillary clearance is filled and a slight fillet is formed.

With fittings having a preinserted alloy ring, the assembly should be heated until a fillet of alloy appears around the edge of the fitting. Sometimes it is necessary to feed additional brazing alloy around the edge to complete the joint.

Regardless of the type of fitting, the heat should be applied quickly to avoid overheating. Chromium oxides form rapidly, and it will be impossible to make a braze if the joint is overheated. The proper heat can be judged by watching the flux, as this is completely molten at 1,100 F. Prolonged heating or overheating will cause carbide precipitation (see Fig. 5B) with consequent lowering of corrosion resistance. Stabilized alloys will overcome this objection.

After brazing, the excess or fused flux should be removed by rinsing the part or immersing it in hot water.

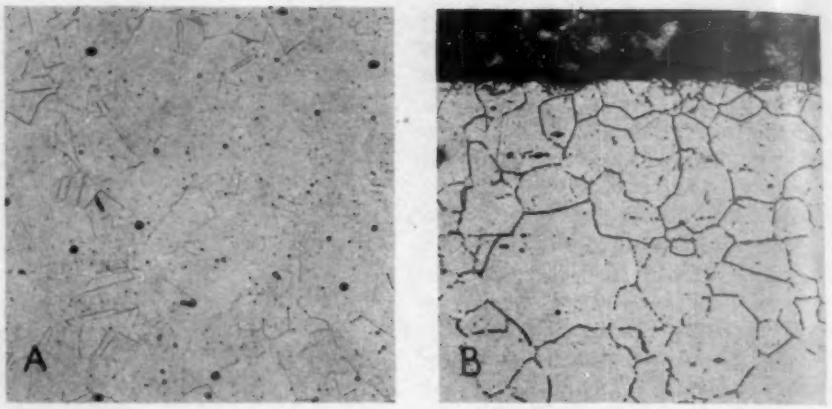


Fig. 5—Prolonged heating or overheating while making brazed joints in austenitic stainless steel will cause carbide precipitation as revealed in these photomicrographs. (A) Shows normal structure of tubing not affected by heat; (B) grain-boundary carbide precipitation due to overheating

The author wishes to acknowledge the valuable assistance of his associates in the research and metallurgical laboratories of Crane Co. in furnishing much of the data that appeared in this series of articles. Special thanks are due to H. A. Young and J. J. Kanter for their suggestions in preparing the manuscripts, to W. L. Meinhart for the excellent metallographic studies, to I. H. Carlson and R. A. Mueller for the welding investigations and to J. B. Flad and W. W. Wilke, Jr., for the photographic work.

Table I. Most Widely Used Soft Solders

Composition			Melting Range, F		Max. Service
Tin %	Lead %	Antimony %	Solid	Liquid	Temp., F
50	50		361	421	250
60	40		361	372	250
95	5		361	437	250
95		5	450	464	250–300
100			450	450	250–300

Table II. Two Popular Brazing Alloys

Chemical Composition					Melting Range, F	
Silver %	Copper %	Zinc %	Cadmium %	Nickel %	Solid	Liquid
50	15½	16½	18		1,160	1,175
50	15½	15½	16	3	1,195	1,270

Short Cuts and Kinks

Any ideas for this section? Send them to THE WELDING ENGINEER, 520 N. Michigan Ave., Chicago 11. Payment made at our usual rates.

Cleaning for Argon Welding

IN SEARCHING for a satisfactory method of cleaning aluminum to prepare it for welding by the inert-gas-shielded arc process, engineers of the General Electric Co. discovered that the best results were produced by successive dips in sodium hydroxide and sulphuric acid.

Wire brushing, the first-method of cleaning tried at G-E, only ground the oxide and dirt into the surface of the aluminum. Sandpapering proved to be successful only if all kerosene or lard oil (used as a lubricant in machining) had been completely removed before the sandpaper was applied. Furthermore, sandpapering was too slow for small parts.

The answer seemed to be a chemical dip. Nitric acid looked like a logical candidate since it is used extensively for brightening aluminum. A sample was cleaned by this method and welded. Inspection revealed that the weld bead was sprinkled with a black substance which accumulated in small surface pits. The discoloration was easily brushed off, but the pits remained to mar the surface.

The specks were analyzed and found to be rich in nitrides; the trouble might be caused by too great a percentage of nitrogen in the argon shielding gas. When this possibility had been eliminated, the nitric acid was blamed, sulphuric acid was tried instead. Results were good and led to the following cleaning technique:

First, the aluminum is given a brief degreasing in a 5% solution of sodium hydroxide to remove grease, oil and/or wax. This is followed by a brief wash in water to remove the caustic and most of the surface scum. The aluminum is then dipped in a 50% solution of sulphuric acid to complete removal of the oxide skin and restore most of the surface brightness. Finally, a hot water bath washes away the acid before it can begin to corrode the aluminum.

Welding tests made on samples cleaned by this method resulted in mirror-bright, fine-contoured beads as welded.

* *

Bending Sheet Metal

EVERYONE knows that metal is more easily worked hot than cold, but it is not so well known that the oxy-acetylene flame is a handy source of local heat when sheet metal is to be bent to shape over a template. Irregular and complicated forms can be shaped easily and quickly when the worker's skill is supplemented with the aid of the oxy-acetylene flame. A typical application is shown in the accompanying picture—the shaping of a sheet of 18-gauge stainless steel into a spout for a centrifuge.

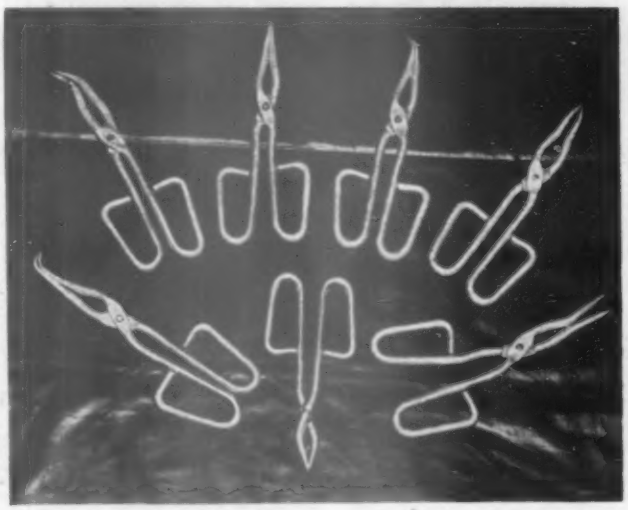
* *

Aluminum Hand Tools

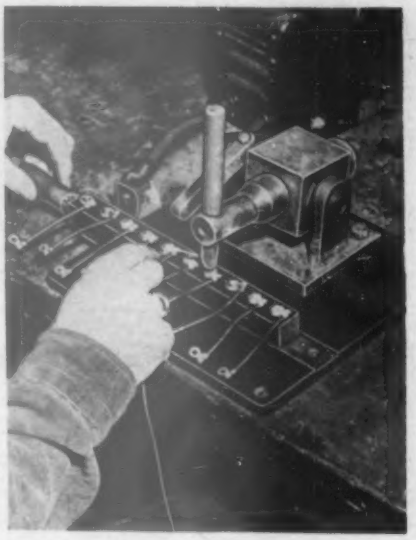
PLIERS, tongs and other special hand tools to feed parts to punch presses are easily fabricated from ⅜-in. aluminum bar stock, according to the Reynolds Metals Co., Louisville, Ky. The ⅜-in. round 2S aluminum bar stock is soft and may be easily bent by one of the plant mechanics into any shape of hand tool that may be needed for a particular job. The stock is of sufficient diameter to provide a comfortable hand grip, and the light weight of the tools fabricated from it enables them to be used steadily all day long without tiring the operator.

Courtesy, The Linde Air Products Co.

This worker is using an oxy-acetylene torch to shape a spout for a centrifuge



Typical tools used by the housewares division of Reynolds Metals Co. to handle utensils shaped on punch presses



Soldering dynamotor leads to terminals in a mass-production basis is made possible by a multiple holding fixture and a carbon electrode connected to a special soldering transformer

Soldering Leads to Terminals

BY USING a holding fixture with a carbon electrode, the soldering of dynamotor leads to terminals has been greatly speeded up at the small motor division of the Westinghouse Electric Corp., Lima, O.

Under the old method only one lead at a time could be soldered to a terminal. The "holding fixture" was a plate with a hole drilled in it to suit the terminal, and a copper-tipped soldering iron was employed.

The new method makes use of a multiple holding fixture and a soldering transformer, as shown in the accompanying picture. After the fixture holding the terminals has been positioned with the left hand, the carbon electrode is lowered until it touches the first terminal. This completes the circuit since the electrode is connected to one transformer lead and the fixture is connected to the other. Immediately, the solder melts and flows over the face of the clip. The operation is then repeated with the other terminals.

On the Job

Courtesy The Sight Feed Generator Co.

This American acetylene generator was mounted on a Fiat car to supply fuel for motoring

Motoring with Acetylene

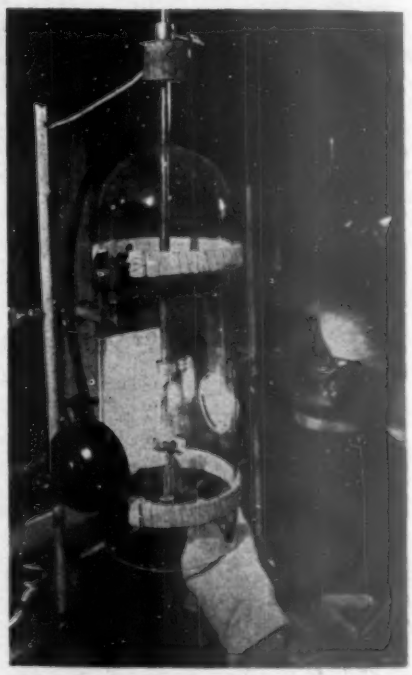
THE USE of an acetylene generator (American make) for powering an automobile may leave much to be desired in motoring, but it certainly does emphasize the manufacturer's claim that these generators are truly portable. This unusual installation was made by Chr. Finckenhagen of S. D. Lilleide A/S, Oslo, Norway, to supply fuel to run a small Fiat car. Imitation is not recommended; these generators are built to produce acetylene for welding and cutting purposes, not for automotive power.

Acetylene generators of the type usually sold in Norway, THE WELDING ENGINEER is informed, are of the water-to-carbide type, rather than the safer carbide-to-water type prevalent in this country.

* *

Welded Tungsten Filament

THE extremely high melting point of tungsten—6,152 F—renders it a next-to-impossible metal to weld. The problem was solved, however, at the Brooklyn plant of the Amperex Electronic Corp. by using a carbon arc and doing the work inside a bell jar filled with an inert gas to prevent oxidation of the metal.



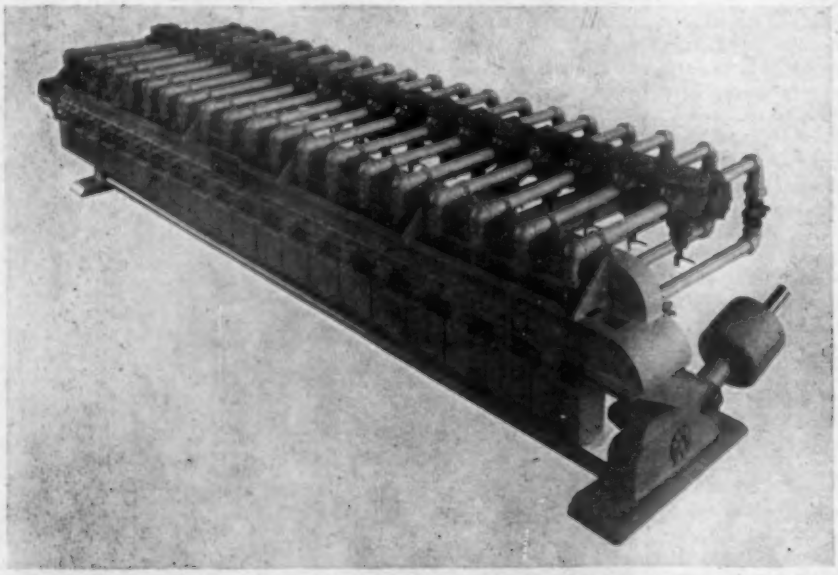
This operator is welding a tungsten filament to tungsten supports as a step in the manufacture of a high-frequency tube for radar. The bell jar contains an inert gas to shield the metal from atmospheric oxygen

The accompanying illustration shows the tungsten filament of a VT90 transmitting tube (an ultra-high-frequency tube designed for radar) being welded to its tungsten supports. The operator must, of course, wear dark glasses, and hence two spotlights are provided at the sides of the bell jar so that she can see to strike the arc.

Preheating Strip for Tubes

BY PREHEATING formed strip under a production line of gas-air burners, tubing is now being welded from hot-rolled instead of cold-rolled stock at a substantial saving in welding costs. An expensive edge-trimming operation is also eliminated.

The installation below is designed for a production speed of more than 100 ft per min. The burners receive the stock directly from the forming rollers, heat it to 2,000 F and discharge it to the welder. The equipment consists of twenty burners with manifolding and frame construction, a gas-air combustion controller, "Flo-Scopes" and safety equipment. The burners are of the type characterized by having numerous hard flames deep inside a refractory cell so that the combustion is almost totally enclosed.



Courtesy Selas Corp. of America

This installation of twenty gas-air burners preheats formed strip for welded steel tubing

OPPORTUNITIES FOR WELDING

Plate, Pipe and Tank—Structural—Buildings—Repairs and Hard-Facing

* Projects $500,000 and more in value.
† Federal Government Projects.

Plate Welding Pipe & Tank

Contract Awarded

Arkansas—GAS PIPELINE—Mississippi River Fuel Co., 407 N. 8 St., St. Louis, Mo., 12 mi. gas pipeline through Independence and Jackson Counties, to Holland Const. Co., Kennedy Bldg., Tulsa, Okla. Est. $240,000.

Contract Awarded

Calif., Aptos—GAS TRANSMISSION LINES—Coast Counties Gas & Electric Co., 22 Pacific Ave., 10 mi. gas transmission line near here, to Pacific Pipe Line Constr. Co., 2268 Firestone Blvd., Los Angeles. $250,000.

Contract Awarded

Calif., La Mesa—RESERVOIR—La Mesa Lemon Grove & Spring Valley Irrigation Dist., 4769 Spring St., two welded or riveted steel, 10,000 bbl. rein.-con. reservoirs, Grossmont No. 3 at Elgranite Ave. and Fuerte Dr., and Helix on Mt. Helix Rd., to Robert McKenna, Solano Beach. $34,266. Bids 10/15.

Contract Awarded

Calif., Sacramento—City, City Hall, water pipeline from 6 and Q Sts. to 23 St. and 11 Ave., and steel pipeline in 30 St. between H and I St., to Tom L. Gogo, 10024 S. Figueroa St., Los Angeles. $291,500. Bids 10/11. F. Klaus, City Hall, engr.

Contract Awarded

Calif., Vernon—OIL STORAGE—Filtrol Corp., 3250 E. Washington Blvd., Los Angeles, tanks, foundations, walls, pits, tower and oil storage facilities, to Fluor Corp., Ltd., 2500 S. Atlantic Blvd., Los Angeles. Approx. $52,500.

Contract Awarded

Fla., St. Petersburg—GAS PLANT—City, c/o F. Sharpe, mgr., gas plant addn., to Semet Solvay, 40 Rector St., New York, N. Y. $437,660.

Contract Awarded

Ill., Fairfield—TANK—City, E. P. Fleming, clk., WW imprvs., furnishing, installing 300,000 gal. water tank, less fdn., to Chicago Bridge & Iron Co., 332 S. Michigan St., Chicago. $31,500. Bids 9/17. Warren & Van Praag, Inc., Standard Office Bldg., Decatur, engr.

Low Bidder

Md., Northeast—TANK—Town Comrs., Municipal Bldg., water tank, from W. G. Fritz Co., 69 Main St., West Orange, N. J. $133,348.

Low Bidder

★ **Mass., Boston**—SHAFT—Commonwealth of Mass., 20 Somerset St., Oct. 30, Contrs. 117A and 117B, constr. Shafts 6 and 7 of Hultman Tunnel Water Supply, from Marinucci Bros. & Co., Dorchester, $522,529. Est. over $500,000.

Contract Awarded

Miss., Batesville—NATURAL GAS SYSTEM—City, c/o D. L. Ferguson, natural gas sys., to R. R. Littrell, Opelousas, La. $101,700. Plans deposit $10. T. O. Mabry, Jr., Box 155, Moss Point, engr.

Low Bidder

★ **N. Y., New York**—WATERMAINS—Comr. Water Supply Gas & Electricity, Municipality Bldg., Zone 7, Oct. 4, furnishing, del., laying steel and c.i. watermains, appurtenances in Rockaway Blvd., Queens Boro., from Tufano Contg. Corp., 168-22 91 Ave., Jamaica. $737,458.

Contract Awarded

O., New Lexington—Watermains—Bd. P. Affairs, imprv. WW plant and watermains, to Christopher & Co., Inc., 643 Green Rd., Cleveland, $132,000; tank, to Chicago Bridge & Iron Co., Guild-hall Bldg., Cleveland, $32,000. Awarded 10/15.

Contract Awarded

Oklahoma—OIL PIPELINE—Stanolind Pipe Line Co., Stanolind Bldg., Tulsa, replacing 4 in. crude oil pipeline with 6 in., Cotton Co. Owner builds. Approx. $110,000.

Contract Awarded

Tenn., Jackson—TANK—City, c/o P. H. Callahan, comr., City Hall, Jackson, 2 m. g. water tank and 13 mi. water line extens., to Volz Const. Co., Ripley. $514,675. Hart, Freeland & Roberts, Third Natl. Bank Bldg., Nashville, engrs.

Contract Awarded

Texas—PIPELINE—Carbide & Carbon Chemicals Corp., 442 Cassiano St., San Antonio, reconditioning and somastic coating 20 mi. 4½ in. pipeline, Bexar Co., to H. C. Price Co., 442 Cassiano St. $46,000.

Contract Awarded

Texas—PIPELINE—Magnolia Pipe Line Co., Magnolia Bldg., Dallas, 35 mi. 8 in. loop oil line on Port Arthur-Corpus Christi-Seeligson line, to J. R. Horrigan Constr. Co., Commerce Bldg., Houston. Approx. $286,000.

Contract Awarded

★ **Texas**—PIPELINE—Pasotex Pipe Line Co., Iraan, 98 mi. 10¾ in. crude oil pipeline carrier from Irran to Wink, to Smith Contg. Co., Fort Worth National Bank Bldg., Fort Worth, approx. $1,375,000; 98 mi. 10¾ in. crude oil pipeline reconditioning and Somastic coating, Wickett, to H. C. Price Co., Wickett, approx. $125,000.

Contract Awarded

Texas—PIPELINES—Shell Pipe Line Corp., Mayo Bldg., Tulsa, Okla., reconditioning, replacing crude oil pipelines, Seymour and Rankin areas, to Holland Constr. Co., Old Spanish Trail, Houston. Approx. $85,000.

Contract Awarded

Texas—PIPELINES—Warren Petroleum Corp., 2 National Bank Bldg., Houston, 50 to 60 mi. gathering pipelines, Archer Co., to Holland Constr. Co., Old Spanish Trail Rd., Houston. Approx. $120,000.

Contract Awarded

Tex., Houston—GAS MAINS—United Gas Corp., United Gas Bldg., natural gas mains and lateral natural gas lines. Owner builds. $280,000.

Contract Awarded

Tex., McAllen—Hidalgo County Water Control & Imprvt. Dist. 15, McAllen. 48 mi. irrigation pipe lines, and 166,000 sq. ft. granite or brick canal lining, etc., force account. Approx. $450,000.

Low Bidders

†**Washington**—PIPELINES—Bureau Reclamation, Yakima, Oct. 22, earthwork, pipelines, lateral systems and pump area, Roza Div., Yakima Proj., Spec. 1486, from J. A. Terteling & Sons, Inc., 4011 Fairview Ave., Boise, Idaho. $94,509. W. R. Young, Customhouse, Denver 2, Colo., engr.

Low Bidders

★ **Wash., Olympia**—PRESSURE LINE—City, City Hall, Oct. 29, 3,725 ft. 36 in. steel pressure line, 2 m. g. reservoir, 37,500 ft. 36 in. supply line, etc., from American Pipe & Constr. Co., 518 N. E. Columbia Blvd., Portland, Ore., $1,444,307. Est. $1,200,000.

Contract Awarded

B. C., Vancouver—GAS PLANT—B. C. Electric Railway Co. Ltd., 425 Carrall St., Vancouver, gas plant addn. 4,500,000 cu. ft. capacity water cooling tower, storage tanks and gasometer, to John Inglis Co. Ltd., 525 Seymour St. About $700,000. Awarded 10/10.

Contract Awarded

N. B., Sackville—WELLS—Municipality, drilling, constructing artesian wells, to Trask Well Co., Inc., Sackville. Est. $39,000.

LATIN AMERICA

★ **Ecuador, Guayaquil**—WATER SUPPLY—Municipality, water supply system, to Frederick Snare Corp., 233 Bway., New York, N. Y., U.S.A. Est. $4,000,000. Buck, Seifert & Jost, 112 E. 19 St., and Pitometer Co., 50 Church St., both New York, N. Y., U.S.A., consult. engrs.

★ **Mexico**—GAS PIPELINE—Gas Industrial de Monterrey, Monterrey, 135 mi. 14 in. natural gas pipeline carrier between Reynosa to Monterrey, to Contratistas del Norte, S. A. Monterrey, Mexico (affiliate of O. C. Whitaker & Co., Dan Waggoner Bldg., Fort Worth, Tex., U.S.A.). Approx. $2,650,000.

★ **Venezuela**—OIL PIPELINE—Creole Petroleum Corp., La Salina, 2 sections (20 mi. each) 24 in. crude oil pipeline carrier, at Amuay Bay on Paraguana Peninsula, and 2 sections (56½ mi. each) 26 in. crude oil pipeline radiating from La Salina, near Paraguana Peninsula, to Williams Bros. Corp., National Bank Tulsa Bldg., Tulsa, Okla., U.S.A. Approx. $2,000,000 and $6,250,000 respectively.

Structural Bridges and Other

Contract Awarded

California—TOWERS—Pacific Gas & Electric Co., 245 Market St., San Francisco, 2 steel crossing towers for transmission lines, Solan Co., to Judson-Pacific-Murphy Co., 1200 17 St., San Francisco. Est. $150,000.

Low Bidder

★ **D. C., Wash.**—BRIDGE—Dist. Comrs., District Bldg., Oct. 31, superstructure for South Capitol St. Bridge, from Phoenix Bridge Co., Phoenixville, Pa. $2,123,354. (Correction—price).

Low Bidder

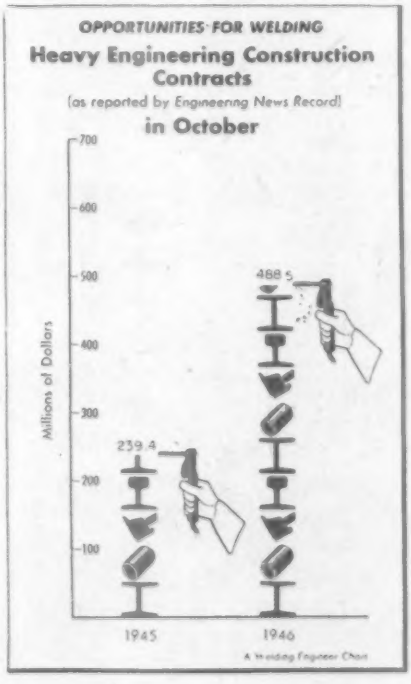
Florida—BRIDGES—State Hy. Dpt., Tallahassee, Oct. 31, widening two 99 ft. bridges, Broward Co., from Brinson Const. Co., First Natl. Bank Bldg., Tampa. $103,277.

Contract Awarded

Illinois and Missouri—Terminal Railroad Assn., H. Austill, ch. engr., 1800 Market St., St. Louis, Zone 3, Mo., reconstructing pedestrian and vehicular deck Eads Bridge over Mississippi River, to Robinson Erection Co., 1839 Knox Ave., St. Louis 10, Mo. Est. $291,000.

Low Bidder

Louisiana—BRIDGE—State Hy. Dpt., Baton Rouge, Oct. 16, Bayou Barataria Bridge, Jefferson Parish, from Gordon Walker, P. O. Box 528, Baton Rouge. $214,489.



Contract Awarded

Maryland—BRIDGE—State Hy. Dpt., Baltimore, Oct. 22, bridge, Caroline and Talbot counties, to Tidewater Constr. Co. 538 Front St., Norfolk, Va. $228,245.

Low Bidder

Michigan—BRIDGE—State Hy. Dpt., Lansing, Oct. 9, rein.-con., steel bridge, over Portage Creek, Kalamazoo Co., from L. W. Lamb, 1833 Park Rd., Holland, $64,686, Bridge over Black River, Sanilac Co., from F. C. Atlewed, 19712 Littlefield St., Detroit, $109,540.

Low Bidder

New York—BRIDGE—Bureau Contrs. & Accounts, Albany, Oct. 30, bridge on 3.4 mi. Broome and Tioga Counties, from Tripple Cities Constr. Co., 17 Tompkins St., Binghamton. $486,737. Est. $526,000.

Low Bidder

★ **N. Y., Brooklyn**—PLATFORMS EXTENSIONS—Bd. Transportation, 250 Hudson St., New York, Zone 13, platform extens. at Hoyt St. Station, Brooklyn-Manhattan branch of New York City Transit Sys., IRT Div., Contr. 2, from National Structures Corp., 10 E. 40 St., New York, Zone 17. $679,700.

Contract Awarded

Oklahoma—BRIDGES—State Hy. Dpt., Capitol, Oklahoma City, 3 rein.-con., steel bridges over the Caney River, on Hy. 60, east of Bartlesville, Washington Co., to J. A. Raines & Co., Muskogee. $261,233. Est. $239,544. Awarded 10/10. H. E. Bailey, Capitol, engr.

Contract Awarded

Oklahoma—BRIDGES—State Hy. Dpt., Oklahoma City, to Ottinger Bros. Co., 3801 North May Ave., Oklahoma City, 3 bridges McCurtain Co. $83,026, est. $80,024; bridge Love Co., $157,033, est. $151,859; 4 bridges Harmon Co. $69,228, est. $66,144***to List & Weatherley Const. Co., Railway Exchange Bldg., Kansas City, Mo.; 6 bridges Washington Co. $172,469, est. $173,131***to Smity Bros. Co., Noble, bridge Caddo Co. $214,011***to Allen & Grega, Henryetta, 2 bridges Leflore Co. $67,976, est. $62,368. Grand total $762,843. Bids 10/29.

Low Bidder

South Carolina—BRIDGES—State Hy. Dpt., Columbia, Oct. 15, bridges in Berkley, Georgetown and Williamsburg Counties, and Charleston Co., from McKeekin Const. Co., Cheraw, $112,737 and $83,628 respectively*** Darlington and Marlboro Counties, from Bowers Constr. Co., 805 W. South St., Raleigh, N. C., $100,621***Dillon Co., from C. Y. Thomason Co., Greenwood, $107,331***Hampton Co., from Wannamaker & Wells, Inc., Orangeburg, $48,957.

Low Bidder

Texas—BRIDGES—State Hy. Dpt., Austin, Oct. 22, 4 bridges, approaches 0.131 mi. Hy. 320 Control 590-3-2, Bell and Falls Counties from Thomas & Ratliff, Rogers, $112,470. P. & S. F. overpass, approaches 1.019 mi. Hy. 87, FAGH 546 (14) Lubbock Co., from Ernest Loyd, P. O. Box 1120, Fort Worth, $180,213.

Low Bidder

Virginia—BRIDGES—State Hy. Dpt., Richmond, Oct. 15, 3 bridges and 0.54 mi. paving Rte. 58, Pittsylvania Co., from Harvey H. Stewart, 604 Hawthorne St., Charlotte, N. C. $236,446.

Contract Awarded

West Virginia—BRIDGE—State Hy. Dpt., Charleston, new floor sys., St. Mary's bridge, Pleasants Co., to Ferguson & Edmonson, Keystone Bldg., Pittsburgh, Pa., $164,233***constructing Junction Bridge 1627, Hampshire Co., to George F. Hazelwood Co., Cumberland, Md., $65,379***Sycamore Bridge 952.1 and approaches, Jackson Co., to J. M. Francesa & Co., Fayetteville, $49,002. Grand total $278,614.

Structural & Piping—Buildings—All Types

Low Bidder

Ala., Birmingham—SCHOOL—Catholic Diocese, c/o Bishop T. J. Toolen, Lafayette Ave., Mobile, Oct. 17, Catholic high school, from Daniel Constr. Co., 822 7 Ave., S. $399,045. Est. $350,000.

Contract Awarded

Ark., Bentonville—PLANT—Arkansas Farm Bureau Co-operative Inc., c/o W. L. Burton, pres., Bentonville, poultry processing plant, to E. V. Bird Constr. Co., Fayetteville. Est. $450,000.

Contract Awarded

★ **Calif., Alameda**—FACTORY—Kieckhefer Container Co., c/o H. D. Harris, Pacific Coast mgr., 2 Pine St., San Francisco, 1 story structural steel factory, glass enclosed factory section manufacturing fireboard products, spur track to Cahill Bros., 206 Sansome St., San Francisco. Est. over $500,000. W. W. Oeflein, Inc., 5345 N. Hopkins St., Milwaukee, Wis., engr.

Contract Awarded

★ **Calif., Bakersfield**—PLANT—Pacific Gas & Electric Co., 245 Market St., San Francisco, 100,500 hp. capacity, rein.-con. steam operated electric generating plant, Rosedale Hy., 5 mi. northwest of here, to Stone & Webster Eng. Corp., 601 W. 5 St., Los Angeles, approx. $10,000,000.

Contract Awarded

Calif., Burlingame—TELEPHONE EXCHANGE—Pacific Telephone & Telegraph Co., 140 New Montgomery St., San Francisco, steel, brick telephone, exchange addn. and 5,800 sq. ft. addnl. space to 3 story bldg., to MacDonald, Young & Nelson, 127 Montgomery St., San Francisco, Est. $250,000. H. A. Thomsen, Jr., 315 Montgomery St., San Francisco, archt.

Contract Awarded

★ **Calif., Culver City**—PLANT—Carnation Milk Co., Oconomowoc, Wis., fresh milk plant, 2 story, bamnt., 150x260 ft. bldg., 2 story, 100x150 ft. office, 85x570 ft., garage and shop, rein.-con., structural steel bldg., south of Exposition Blvd. at Jefferson Blvd., to Howard Hastings, Inc., 1135 N. Los Palmas Ave., Los Angeles. Approx. $2,000,000. J. K. Anderson, 5225 Wilshire Blvd., Los Angeles, engr.

Contract Awarded

Calif., Los Angeles—STUDIO and FACTORY—Columbia Recording Corp., 6624 Romaine St., Hollywood steel, concrete and rein.-con. studio and factory, Alden Dr. between Robertson Blvd. and Howell Rd., to The Austin Co., 777 Washington Blvd., Los Angeles. Approx. $295,000. A. E. Schmidt, 777 E. Washington Blvd., engr.

Contract Awarded

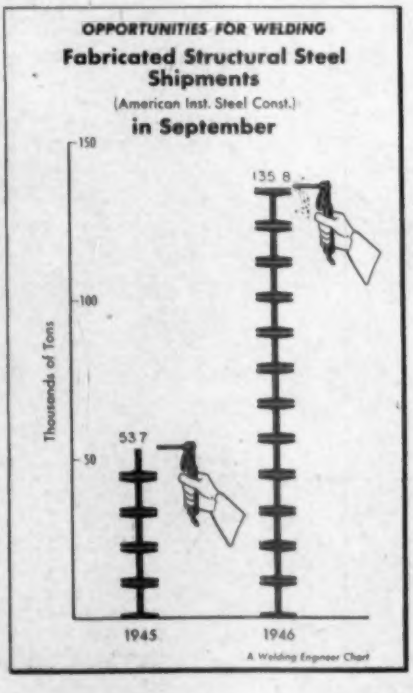
★ **Calif., Los Angeles**—General Petroleum Corp., 13 story, bamnt., office bldg., Flower St., Wilshire Blvd. to Sixth St., to P. J. Walker Co., 3900 Whiteside Ave. Over $5,000,000. Wurdeman & Becket, 3757 Wilshire Blvd, archts.

Contract Awarded

Calif., Los Angeles—FACTORY—A. Moody & Co., 154 E. 57 St., remodeling 2 story 135x580 ft. mattress factory, 5300 S. San Pedro St., to R & S. Woodward, 618 W. Buckthorne Ave., Inglewood. $120,000. P. Haynes, 315 W. 9 St. archt. Brandon & Lustron, 1151 S. Broadway, engrs.

Low Bidder

Calif., Montebello—SCHOOL BLDGS.—Montebello Unified School Dist., 2100 W. Cleveland St., Oct. 22, high school buildings at Bell Gardens, from Baruch Corp., 621 S. Flower St., Los Angeles. $759,950.



Contract Awarded

Calif., Pomona—PAPER MILL—Fernstrom Paper Mills, Inc., Pomona, 115x340 ft. steel, corrugated asbestos paper mill, West Holt Ave., near Erie St., to Southwestern Eng. Co., 4800 S. Santa Fe Ave., Vernon. Approx. $300,000.

Contract Awarded

Calif., San Francisco—PLANT—Kingan & Co., 446 Drumm St., San Francisco, 1 and 2 story, rein.-con., structural steel meat processing plant, spur track to Cahill Bros., 206 Sansome St. Est. $330,000-$350,000. L. H. Nishkian, 1045 Sansome St., San Francisco, engr.

Low Bidder

Calif., San Mateo—San Mateo Elementary School Dist., 120 N. Ellsworth Ave., 1 story, steel, wood frame, Borel School, incl. 3 bldgs., shower, locker room and classrooms from Carrico & Gautier, 365 Ocean Ave., San Francisco. 287,706. Franklin, Kump & Falk, 251 Kearny St., San Francisco, engrs. and archts.

Contract Awarded

†**Colo., Denver**—REMODELING BLDGS.—Pub. Rds. Admin. 18 and F Sts., N. W., Wash., 25, D. C., remodeling 5 bldgs. in Federal Center, for Bureau Reclamation, to Mead & Mount Const. Co., 422 Denver Natl. Bank Bldg. $835,000. Bids 9/27.

Contract Awarded

Conn., Darien—APARTMENTS—Town, Bd. Selectmen, Town Hall, 80 apartments, to George L. Hickey, Inc., 105 Bedford St., Stamford. Est. $230,000. D. A. Tarpley, Sunswyck Rd., archt.

Contract Awarded

Conn., Hartford—HOSPITAL ADDNS.—Mt. Sinai Hospital, 119 Capitol Ave., 3 story 40x140 ft., brick, steel, limestone hospital addns., alterations, incl. pediatrics, obstetrics, surgery depts., laundry, kitchen, dining room, boiler plant, connecting passage, Towers and Blue Hill Aves., to Southern New England Contracting Co., 242 Trumbull St. $606,500. Ebbets & Frid. 15 Lewis St., archts.

Contract Awarded

Del., Edgemoor (Wilmington P. O.)—APARTMENT—Wilmington Constr. Co., Edgemoor, apartment development, separate contracts. $700,000. Armand D. Carroll, archt. and W. J. Stephenson, engr., both 262 S. 15 St., Phila., Pa.

Contract Awarded

Del., Wilmington—CHEMICAL—E. I. duPont de Nemours Co., Inc., duPont Bldg., brick, steel chemical mfg. bldg., Edgemoor, own forces. $114,740.

Low Bidder

★ †**D. C., Wash.**—HOSPITAL—Pub. Bldgs. Admin., 18 and F Sts., N. W., Zone 25, Oct. 29, continued treatment bldg. at St. Elizabeth's Hospital, from Caristo Constr. Corp., 26 Court St., Brooklyn, Zone 2, N. Y. $2,200,000. CD 9/27—ENR 10/3.

Contract Awarded

Fla., Miami—TELEPHONE EXCHANGE—Southern Bell Telephone & Telegraph Co., Hurt Bldg., Atlanta, Ga., telephone exchange bldg. addn., to Barge-Thompson Co., 136 Ellis St., Atlanta, Ga. Est. $600,000. Shutae & Armistead, 1330 Candler Bldg., Atlanta Ga., archts.

Contract Awarded

Fla., Palm Beach—APARTMENT—The Cleveland Shaker Co., c/o Hadley & Atkinson, archts., 211 Taylor Arcade, St. Petersburg, 7 story, 73-unit 109x239 ft., concrete block, steel apartment. Owner builds. $650,000.

Contract Awarded

Ga., Atlanta—MECHANICAL—Atlanta Journal, Forsyth St., mechanical bldg., to J. A. Jones Const. Co., Walton Bldg. Est. over $100,000. Bids 10/8.

Contract Awarded

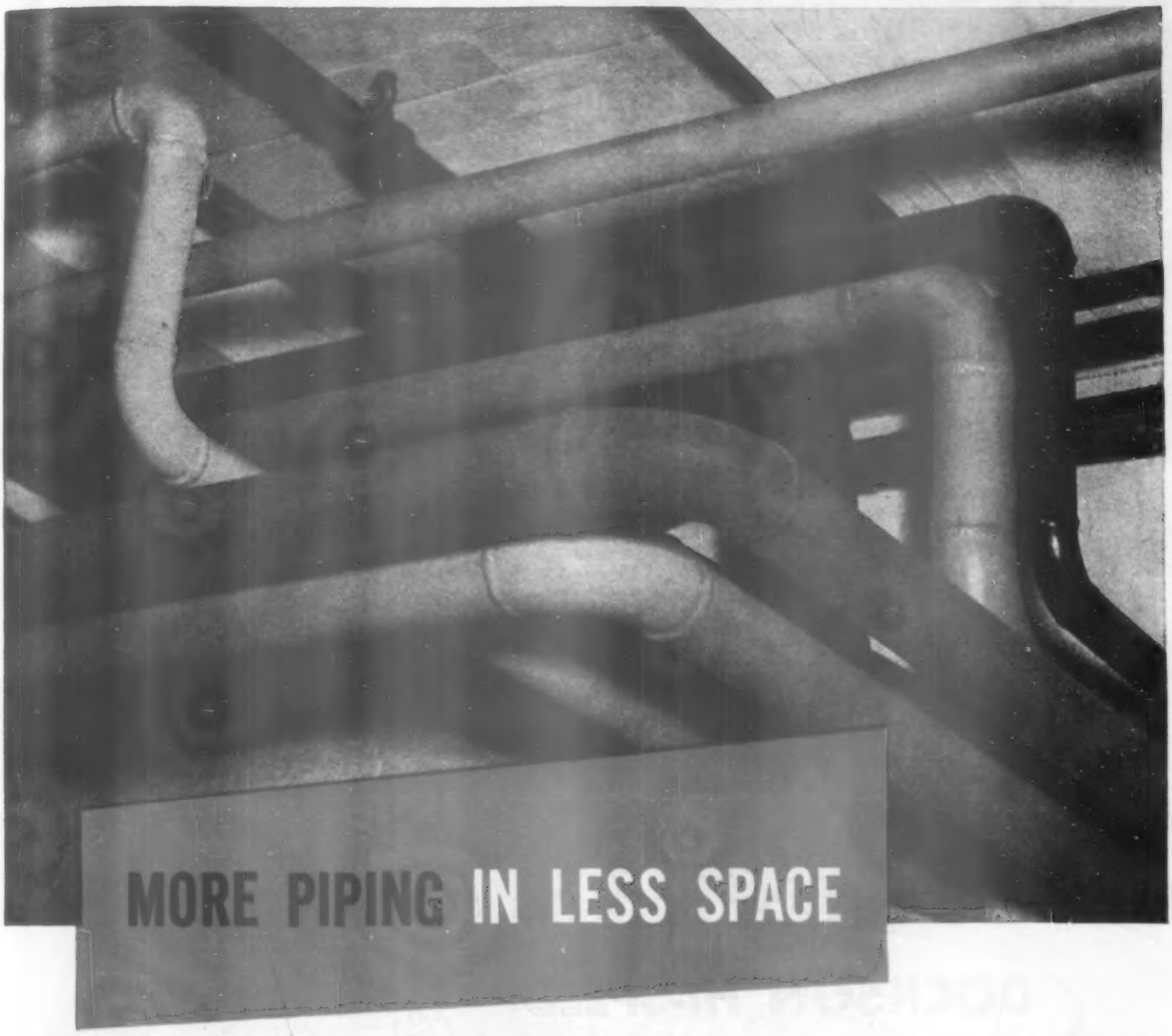
Ga., Atlanta—AUTO REPAIR and STORAGE GARAGE—Roy Livingston, 98 Cone St., auto repair and storage garage, to Griffin Const. Co., 452 Spring St., N. W. $129,751. Bids 10/8

Contract Awarded

Ga., Atlanta—APARTMENTS—Wiley L. Moore, 140 Spring St. N.W., Atlanta, 30 three story, 35x125 ft., brick concrete, steel, apartments. Owner builds. $750,000. A. Thomas Bradbury, 60 5 St. N.W., archt.

Contract Awarded

Ga., Atlanta—SERVICE—Victory Motors, Inc., North Ave., service garage and parts depot, to Ray M. Lee Co., 337 Peachtree St., N.E., $124,000. Cuttins & Howard, Mortgage Guarantee Bldg., archts.



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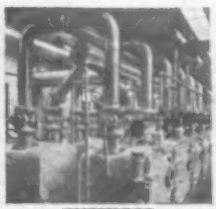
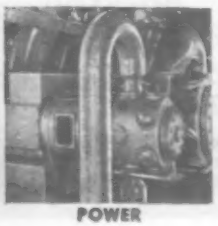

CHEMICAL

GENERAL PIPING

SHIPBUILDING


POWER

EQUIPMENT

Low Bidder

Ga., Dahlonega—SCIENCE BLDG.—Bd. Regents University Sys. of Ga., Atlanta, science bldg. at North Georgia College, from Fennell Const., Box 100, Gainesville. $259,671. Est. $240,000.

Contract Awarded

Ga., Waycross—TRANSFER PLATFORM SHELTERS—Atlantic Coast Line Ry., L. S. Jeffords, ch. engr., Wilmington, N. C., transfer platform shelters, to J. L. Coe Constr. Co., Box 1881, Charlotte, N. C. $102,000.

Low Bidder

Idaho, Boise,—SCHOOL—Independent School Dist., Boise, Oct. 14, Lowell school addns., from C. B. Lauch Co., Box 110, Ogden, Utah, $206,187.

Low Bidders

Idaho, Warm Springs—DORMITORY—Warm Springs State Hospital, general contract dormitory, from Cahill-Mooney Constr. Co., Butte, Mont. $326,720.

Contract Awarded

Ill., Berwyn—NURSES HOME—Mac Neal Memorial Hospital, 3249 S. Oak Park Ave., 2 and 3 story, brick, steel, concrete nurses home and staff quarters, to Kaiser-Ducett Co., 80 E. Jackson Blvd., Chicago. Est. $350,000. Burnham & Hammond, 160 N. LaSalle St., Chicago, archts.

Low Bidder

Ill., Broadview—SCHOOL—School Dist. 92, C. B. Hatch, clk., Oct. 22, 2 story school, from Chell & Anderson, 176 W. Adams St., Chicago, Est. $240,000.

Contract Awarded

Ill., Chicago—PACKING HOUSE—Armour & Co. Union Stockyards, Chicago, remodeling packing house., to Stanley A. Nelson, 543 W. 79 St. Est. $200,000.

Contract Awarded

Ill., Chicago—PLANT Derby—Foods c/o Swift & Co., U. S. Yards, 4 story, brick, rein.-con. packing plant, to Sollitt Constr. Co., 109 N. Dearborn St. Est. $420,000.

Contract Awarded

Ill., Chicago—TELEPHONE EXCHANGE—Illinois Bell Telephone Co., 212 W. Washington St., 4 story, 84x156 ft., brick, concrete, steel telephone exchange, 1900-18 N. Richmond St., to Dahl-Stedman Co., 11 S. LaSalle St. Est. $825,000. Holabrid & Root, 333 N. Michigan St., archts.

Contract Awarded

Ill., Chicago—PLANT—Regensteiner Corp., 310 S. Racine St., masonry contract 4 story, 195x178 ft., brick, concrete, steel printing plant addn., to Carl E. Erickson, 4658 Ravenswood St.***plumbing to Charles Gawne Co., 800 N. Clark St.*** heating and ventilating, to Wm. A. Pope & Co., 26 N. Jefferson St. Est. $300,000. Bids 8/19.

Contract Awarded

Ill., Chicago—Scott Foresman & Co., 625 S. Wabash Ave., 2 story office addn., remodeling 11 story bldg., to Erik Borg, 6649 N. Ridge St. Est. $500,000. Perkins & Will, 309 W. Jackson Blvd., archts.

Contract Awarded

★ **Ind., Evansville**—FILTER PLANT—Bd. P. Wks., City Hall, WW imprvs., Divs. A and B, watermains, pumping and filter plants, to Traylor Bros., Upper Mt. Vernon Rd. $1,193,785. Bids 10/18.

Contract Awarded

†**Ind., Gary**—OFFICE—Veterans Admin., 226 W. Jackson Blvd., Chicago, Ill., 2 story, brick, steel, concrete office bldg., to Marcello Gerometta, 515 Bway. Est. $225,000.

Contract Awarded

★ **Ind., Indianapolis**—APARTMENT—Meadowbrook Co., c/o G. Sadlier, pres., Union Federal Savings & Loan Assn., 620-unit apartment proj., E. 38 St., exten. five 2-story blocks east of Eastern Ave., incl. 27 apts., restaurant, super-market, filling station, and theater. Owner builds. $5,470,000. Lloyd Allen, c/o Allen & Kelley. Architects & Builders Bldg., archts.

Contract Awarded

Ia., Ft. Dodge—FREEZER, SHOP, etc.—Tobin Packing Co., Ft. Dodge, 3 story, bsmnt, rein.-con., structural steel, brick freezer, manufacturing, machine shop bldg., with refrigeration equipment, to W. A. Klinger, Inc., 201 Warnock Bldg., Sioux City. Henschein, Everds & Crombie, 59 E. Van Buren St., Chicago, Ill., engrs.

Contract Awarded

★ **Ia., Storm Lake**—PLANT—Kingan & Co., W. Maryland St., Indianapolis, Ind., 2 story, bsmnt, 80x130 ft. and 100x140 ft., L-shaped, rein-con., brick packing plant, to James Leck & Co., 211 S. 11 St., Minneapolis, Minn. Est. $500,000, incl. equip. Henschein, Everds & Crombie, 59 E. Van Buren St., Chicago, Ill., engrs.

Contract Awarded

Ia., New Hampton—HEATING SYSTEM—City, A. Griffith, clk., municipal heating sys. exten., to Grudem Brothers, 2645 University Ave., St. Paul, Minn. $132,700. Bids 10/14.

Contract Awarded

Kan., Kansas City—FACTORY—Armour & Co., c/o H. Dallas, 18 and Central Sts., Kansas City, Kan., factory, 18 and Central St., day labor. $170,000.

Contract Awarded

Kan., Wichita—PLANT—Kraft Food Co., 5000 N. Prestige St., Chicago, Ill., 1 story, 100x142 ft. distribution plant, to Del E. Webb Const. Co., 75 E. Wacker St., Chicago Ill. Est. $100,000.

Contract Awarded

★ **Ky., Louisville**—HOSPITAL ADDN.—St. Anthony's Hospital, 1313 St. Anthony's Pl., 4 story, 44x233 ft. brick, steel, concrete hospital addn., to A. J. Schneider, 1511 Algonquin Parkway. $625,000. T. J. Nolan & Sons, Ky. Home Life Bldg., archts.

Low Bidders

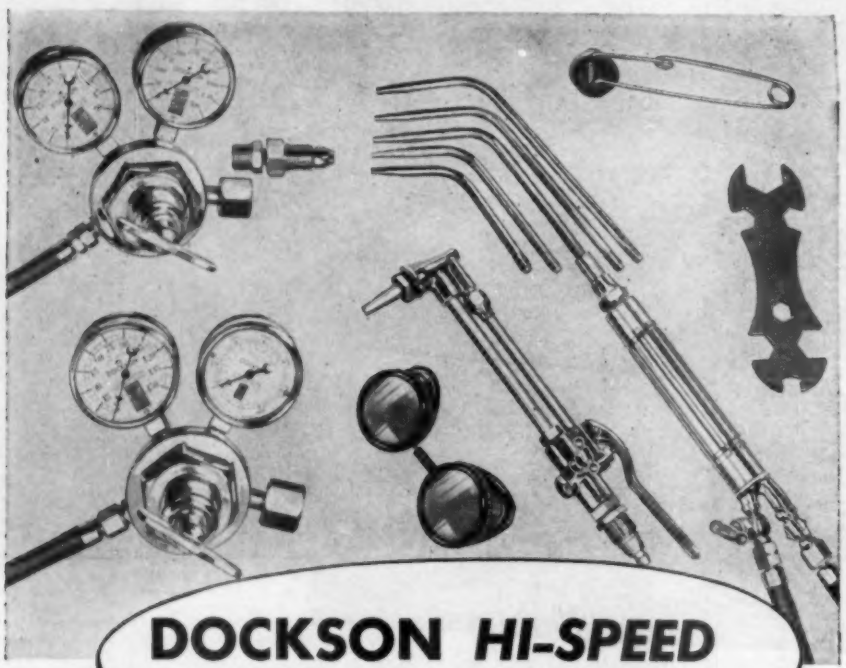
La., Alexandria—BLDGS.—State University, G. F. Mathers, purch. agt., Baton Rouge, general contract constructing bldgs. and utility sys. for the School of Vocational Agriculture, from Roland Const. Co., Alexandria. $276,240. C. T. Roberts, Guaranty Bank Bldg., Alexandria, archt.

Contract Awarded

Md., Baltimore—PLANT—Albert F. Goetz, 240 Sinclair Lane, 3 story, 52x75 ft., brick, steel, concrete meat packing plant addn., to Leland Constr. Co., 200 E. 25 St. About $100,000.

Low Bidder

Mass., Boston—SLUDGE DISPOSAL LINE, ETC.—Comm. of Mass., 20 Somerset St., Oct. 16, 12 in. sludge disposal line, etc., at Nut Island Sewerage Treatment Plant, from Bay State Dredging & Contg. Co., 62 Condor St., East Boston. $575,724.



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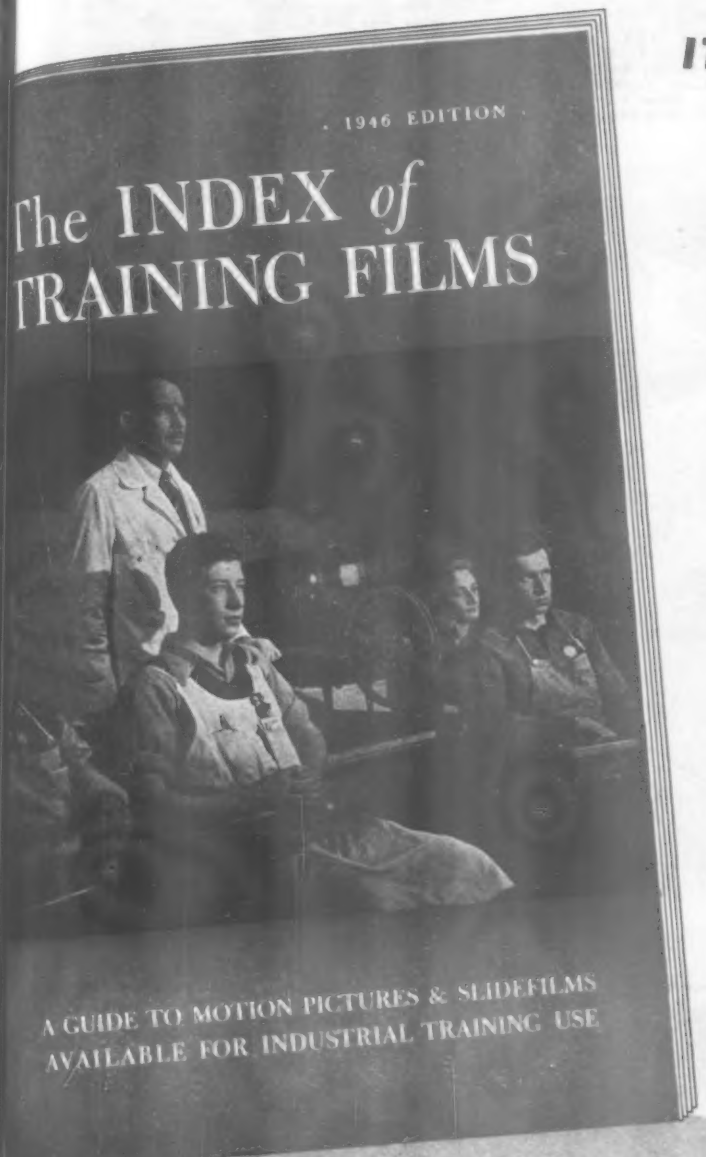

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Contract Awarded

†**Mass., Ft. Devens**—Pub. Bldgs, Admin., Federal Wks. Agency Bldg., Wash., D. C., bldg. addns., alterations, at Mass. State College, to J. Slotnick Co., 38 Newbury St. Boston. $289,632. Awarded 10/10.

Contract Awarded

★ **Mass., Worcester**—WAREHOUSE—New England Grocers Supply Co., 41 Artic St., 1 story, 200x400 ft., brick, steel, concrete warehouse, to Jefferson Constr. Co., 52 Washington Ave., Chelsea. Est. $500,000. Bids 8/9.

Contract Awarded

★ **Mich., Ann Arbor**—HOUSING—H. C. Allen Co., Ann Arbor, 500-home housing development steel panel exterior on 218 acre Dhu Varren farm 1 mi. north of here on US 23. Owner builds. $4,000,000.

Contract Awarded

Mich., Grosse Pointe—SCHOOL—Bd. Educ., Rural Agricultural School, brick, stone, steel, concrete school, to H. M. Martens Co., 2111 Woodward Ave., Detroit. $279,770.

Contract Awarded

Miss., Water Valley—FACTORY—Rice-Stix Co., 1000 Washington St., St. Louis, Mo., garment factory, to McNeese Constr. Co., Commerce Title Bldg., Memphis, Tenn. $204,000. W. A. Mallett & Assoc., Jackson, archts.

Contract Awarded

Mo., St. Louis—OFFICE—J. W. Mackey & B. Moser, c/o P. J. Hoener & C. A. Scott, archts., 3417 S. Kingshighway Blvd., Zone 9, 3 story, 150x215 ft., brick, rein.-con., steel, stone medical office and store, Kingshighway Blvd. and Maryland Ave., to Murch-Jarvis Constr. Co., Inc., 718 Locust St., Zone 1. Est. over $210,000.

Contract Awarded

★ **Mo., St. Louis**—FACTORY—Majestic Mfg. Co., 2134 Delmar Blvd., 1 story, 301x402 ft., brick, steel, rein.con. factory and office bldg., 3900 Neosho St., to L. O. Stocker Co., Arcade Bldg., 812 Olive St., Zone 1. Est. approx. $523,000. H. K. Graf, 2825 Olive St., Zone 3, archt.

Contract Awarded

★ **Mo., St. Louis**—BUS GARAGE—St. Louis Public Service Co., 39 St. and Park Ave., 1 story, 257x430 ft. bus garage, 1 story, 50x26, ft. office, 102x202 ft. shop, to Frazier-Davis Const. Co., 1319 Mackland St. Est. $750,000. F. Cann, 1319 Mackland Ave., archt.

Contract Awarded

Neb., Omaha—WAREHOUSE—Union Pacific R. R. Co., B. H. Prater, ch. engr., 15 and Dodge St., produce warehouse, to Metcalfe Constr. Co., 854 National Bank Bldg., Omaha. $100,000.

Contract Awarded

★ **Neb., Scottsbluff**—HOSPITAL—St. Mary's Hospital, Scottsbluff, hospital, to Olson Constr. Co., 410 S. 7 St., Lincoln. Est. $1,000,000.

Contract Awarded

N. J., Deepwater—PLANT—E. I. duPont de Nemours Co., Inc., du Pont Bldg., Wilmington 98, Del., detergent plant, own forces. $556,800. Granville M. Read, ch. engr.

Contract Awarded

★ **N. J., Hillside**—WAREHOUSE, etc.—Kresge Dpt. Store of Newark, 715 Broad St., Newark, 2 story warehouse and distribution center, N. Broad St., to David O. Evans, 1445 N. 3 St. Est. $500,000.

Contract Awarded

★ **N. J., Newark**—ENGINEERING BLDG.—Weston Electrical Instrument Corp., 614 Frelinghuysen Ave., design and construction 3 story engineering bldg., to Walter Kidde Constr., Inc., 140 Cedar St., New York, 6, N. Y. Est. $650,000.

Contract Awarded

★ **N. J., Oaklyn**—APARTMENT DEVELOPMENT—Oaklyn Gardens Inc., Frank Adamucci, Scovel Ave., Pennsauken, apartment development, separate contracts. $800,000. G. Von Uffel, 136 Handon Ave., Haddonfield, archt.

Contract Awarded

★ **N. J., Rahway**—COTTON MILL—Allen Industries, Inc., Leind St. and Grand Trunk R.R., Detroit, Mich., cotton mill, to Walter Kidde Constructors, Inc., 140 Cedar St., New York. Est. $800,000.

Low Bidder

★ **N. Y., Brooklyn**—HOUSING—New York City Housing Auth., 122 E. 42 St., New York Zone 17, Oct. 22, general contract Marcy Housing, Proj. NYS-13 and 19, Marcy, Myrtle, Nostrand and Flushing Aves., from P. J. Carlin Constr. Co., 101 Park Ave., New York, Zone 17, $8,643,000***heating and ventilating and plumbing, from Jarcho Bros., 306 E. 45 St., New York, Zone 17, $796,177 and $1,453,310 respectively*** electrical work, from Hanson Electric Corp., 883 48 St., Zone 20, $387,738.

Contract Awarded

N. Y., Flushing—TELEPHONE BLDG.—New York Telephone Co., 140 West St., New York, Zone 7, altering telephone bldg., 137-34 Northern Blvd., to John W. Ryan Constr. Co., 369 Lexington Ave., New York, Zone 17. Est. $205,605.

Contract Awarded

N. Y. New York—OFFICE—American Weekly, 63-7 Vesey St., Zone 7, restoration newspaper office bldg., 63-67 Vesey St., to Edward Robbins, 147 Fourth Ave., Zone 3. Est. $116,111.

Contract Awarded

★ **N. Y., New York**—HOSPITAL—Beekman Downtown Hospital, 115 Beekman St., 7 story hospital, William, Beekman and Spruce Sts., to Vermilyea-Brown Co., 100 E. 42St., Zone 19. Est. $2,750,000.

Contract Awarded

N. Y., New York—CHURCH, etc.—St. Pauls Evangelical Lutheran Church, 1986 Crotona Ave. Zone 57, church, parsonage, parish hall, McGraw and Virginia Aves., to L. M. Neckermann, 205 E. 42 St., Zone 17. Est. $205,000.

Contract Awarded

★ **N. Y., New York**—APARTMENT—Tishman Realty & Constr. Co., 136 E. 57 St., Zone 22, 12 story, penthouse co-operative apartment, 3 E. 71 St. Owner builds. $1,000,000. Emery Roth & Sons. 18 E. 48 St., Zone 17, archts.

Contract Awarded

N. Y., Rome—PLANT—Rome Cable Corp., Rome, mfg. bldg., to James Stewart & Co., 230 Park Ave., New York, Zone 17. Est. $600,000.

Low Bidders

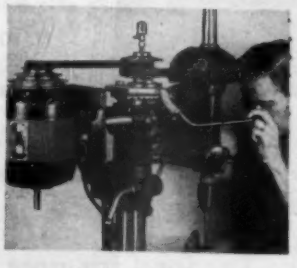
N. C., Rocky Mount—POWER PLANT—City, Oct. 17, power plant imprvs., from V. B. Higgins Co., Greensboro. Approx. $258,000.

Variable Speed Drive Attachment Offers Instant Speed Control for Drill Press Work!

Now you can adjust drill press speeds from high to low—or any intermediate speed—as easily as shifting gears in your car! The Era Variable Speed Drive Attachment enables the operator to provide the correct speed for large or small drills by merely moving a lever. This saving in time results in greater work volume, better work, and lower production cost. **The Era** Attachment fits all popular makes of drill presses, and is easily installed without the necessity of drilling holes or changing present equipment.

To also help save time on the job, many plant owners make chewing gum available to workers. Chewing gum seems to make work go easier, time go faster. Wrigley's Spearmint Gum may be used even when both hands are busy, eliminating work interruptions, and thus promoting greater safety for the operator.

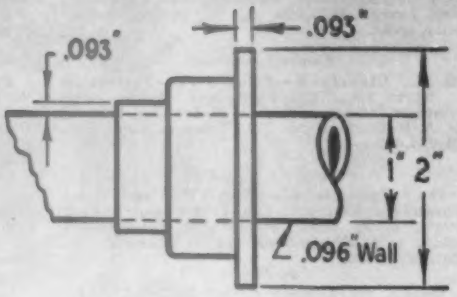
You can get complete information from
Era Meter Co.
3940 N. Kilpatrick Ave., Chicago 41, Ill.



Era Variable Speed Drive

AA-203

How "Job-Rating" can improve YOUR designs!



TYPICAL JOB

Assemble and join thin mild steel stampings and tube to resist torque, compression and shear.
No distortion or surface marking permissible on tube.
Total units required—50,000
Production required—1200 per 8-hr. day

JOB-RATING

METHOD	BEST OUTPUT	MAX. STRENGTH	MIN. FINISHING REQUIRED	LOWEST COST PER PIECE
SPOT WELD	1	1	1	1
ARC WELD		2		2
TORCH WELD				
SOLDER (TORCH)			2	
FURNACE BRAZING	2			

List possible joining methods and controlling factors, as above.
Rate the methods 1, 2, for each design factor.
Select the best method. Check your design with this method in mind.

ANALYSIS

Watch resistance welding come up No. 1 on every count! This example shows over 70% savings for spot welding over the second best method, in labor costs alone. In addition, strength is "tops". There is no distortion. Output is far ahead of other methods. Only design factor involved is to make sure there is room on the sleeve for the spot welds. Your analysis may also show similar advantages for resistance welding in a vast majority of assembly problems. 'Progressive' machines, such as the spot welder at left, prove that it pays to weld on job after job.

For news of the latest developments in resistance welding equipment and methods, influencing product design, ask to be put on the mailing list for the Progressive "WELDING PICTORIAL".

IT PAYS TO WELD

PROGRESSIVE Welder Co. 3050 E. OUTER DRIVE • DETROIT 12

RESISTANCE WELDING EQUIPMENT

Contract Awarded

O., Ashtabula—WAREHOUSE—Ashtabula Box Co., Ashtabula, masonry, steel warehouse, own forces. $120,000. C. V. Martin, Ashtabula, archt.

Contract Awarded

★ **O., Cleveland**—FACTORY—Perfection Stove Co., 7609 Platt Ave., brick, steel, concrete factory addns., 1150 Ivanhoe Rd., to G. A. Rutherford Co., 2725 Prospect Ave. Est. $1,925,000..

Contract Awarded

O., Youngstown—PLANT—Commercial Shearing & Stamping Co., 1775 Logan Ave., 1 story, brick, steel, concrete stamping plant addn., to J. P. Lombard, 311 N. Champion St. Est. $290,000.

Low Bidder

Okla., Oklahoma City—HANGAR—E. Simm. city clk., CAA hangar with attached shop and office bld. at Will Rogers Airport, from Harmon Constr. Co. 1138 N. W. 4 St., $273,500. Est. $225,000. Bids 10/29. Hudgins, Thompson & Ball, 1401 W. Main St., engrs.

Contract Awarded

Ore., Milton—City, City Hall, sewerage sys. and treatment plant to W. C. Smith, Inc., Bd. Trade Bldg., Portland. $280,326.

Contract Awarded

Pa., Marcus Hook—REFINERY—Sun Oil Co., 1608 Walnut St., Phila., repairing refinery, own forces. $300,000.

Contract Awarded

Pa., Meadville—PLANT—Talon, Inc., 626 Arch St., sewage processing plant to Brown & Matthews, 122 E. 42 St., New York, N. Y. $200,000. Bids 9/30. Awarded 10/15.

Contract Awarded

Pa., Meadville—PLANT—Talon, Inc., 939 W. 26 St., Erie, 3 story, 40x320 ft., brick, steel, concrete connecting plant addn. between plants BW and D, to Geo. A. Rutherford Co., 2725 Prospect Ave., Cleveland, O. Est. $200,000. Bids 9/30, awarded 1015.

Low Bidder

Pa. Phila.—HOSPITAL BLDG.—Dpt. Property & Supplies, Capitol Bldg., Harrisburg, Oct. 23, general contract remodeling Female Patient Bldgs. 3 and 7 from Wark & Co., 1700 Sansom St., $303,000.

Contract Awarded

Pa., Pittsburgh—STORE ALTERATIONS Joseph Horne Co., 5 and Stanwix Sts. interior alterations to department store, to Mellon Stuart Co. 210 E. Parkway. $300,000.

Contract Awarded

Pa., Torrance—HOSPITAL ADDN.—Dpt. Property & Supplies, Harrisburg, Oct. 16, general, contract west wing addn. to Bldg. 5, Torrance State Hospital, to Dick Constr. Co., 2532 Library Rd., Pittsburgh. $244,800.

Contract Awarded

Tenn., Memphis—SUB-STATION—Southern Bell Telephone & Telegraph Co., Hurt Bldg., Atlanta, Ga., sub-station, to Barge-Thompson Co., 136 Ellis St., Atlanta, Ga. Est. $260,000. Shutze & Armistead, 1330 Candler Bldg., Atlanta, Ga., archt.

Contract Awarded

Tex., Dallas—PLANT—Lone Star Gas Co., 1915 Wood St., imprv. constructing gas plant, units, $300,000; imprv., replacing gas lines, Owner builds. $275,000.

Contract Awarded

Tex., Dallas—WAREHOUSE—E. H. Perry, 2110 Corinth St., warehouse and addn., to A. J. Rife Constr. Co., 2808 Inwood St. $120,000.

Contract Awarded

Tex., Galena Park—SCHOOL—Galena Park Independent School Dist., Junior High School, to Marshall Constr. Co., 4009 Center St., Houston. Approx. $210,000. Bids Sept. 30 rejected.

Contract Awarded

Tex., Houston—CHEMICAL PLANT—Diamond Alkali Co., Oliver Bldg., Pittsburgh, Pa., design and construction addnl. chemical plant units, to Brown & Root, Inc., Box 3. Approx. $240,000.

Contract Awarded

Tex., Houston—FACTORY—Morgan-Whitley Co., 829 LaBranch St., 2 story, 100x150 ft. and 50x100 ft. rein.-con. frame, steel, masonry factory bldgs. pier fdn., air-conditioning to Walter M. Rainey Constr. Co., 3708 Jardin St., approx. $250,000.

Contract Awarded

★ **Tex., Midland**—OFFICE—Midland Office Bldg., Inc., Midland, superstructure 7 story, bsmnt, office bldg., to J. W. Bateson, 1103 Irwin-Keasler Bldg., Dallas, approx. $556,800.

Contract Awarded

★ **Tex., Orange**—PLANT—E. I. duPont de Nemours & Co., Orange, design and construction methanol plant at Sabine River Works, to The Lummis Co., 420 Lexington Ave., New York, N. Y. $639,000.

★ **Tex., Pasadena**—PLANT—Champion Paper & Fibre Co., Pasadena, paper mfg. addn., and altering, imprv. paper mfg. plant, to Ebasco Service, Inc., Pasadena. $2,375,000 and $525,000 respectively.

Contract Awarded

Tex., San Antonio—HIGH SCHOOL—St. Gerard's Church & Parish, 1617 Iowa St., high school, to Joe Joeris, 219 Ave. A. $217,500. Bids about 9/26.

Contract Awarded

★ **Tex., Texas City**—PLANT—Monsanto Chemical Co. Texas City, polystrene plant and plant conversion for mfg. styrene, to W. S. Bellows Constr. Co., 716 N. Everton St., Houston, $2,600,000, and approx. $500,000 respectively.

Contract Awarded

★ **Vt., Burlington**—HOSPITAL ADDN.—Bishop DeGoesbriand Hospital, S. Prospect St., brick, steel, concrete hospital addn., incl. childrens wing, obstetrical dpt., to Walsh Bros., 150 Hampshire St., Cambridge, Mass. Est. $500,000. J. F. Jefferman, 131 State St., Boston, Mass., archt.

Low Bidders

★ **Va., Bassett**—HIGH SCHOOL—Henry Co. School Bd., Martinsville, Oct. 15, Bassett High School, from English Constr. Co., Altavista. $594,700, incl. escalator.

Contract Awarded

Wash., Vancouver—HOSPITAL ADDN.—St. Joseph's Hospital, 500 E. 12 St., hospital addn. to Ross B. Hammond Co., 1241 N. Williams St., Portland, Ore. Est. $250,000.

Contract Awarded

Wash., Seattle—FERRY HOUSE, etc.—Puget Sound Navigation Co., Colman Dock, Zone 4, repairing altering Colman ferry bldg., and pier to Manson Constr. & Engr. Co., 821 Alaskan Way, Seattle, Zone, 4 Est. $200,000.

Contract Awarded

Wash., Seattle—PLANT—Zellerbach Paper Co., 1258 1 Ave. S., design and construction, alterations and enlargments paper plant, to The Austin Co., 16112 Euclid Ave., Cleveland, O., $350,000.

Low Bidder

Wash., Spokane—BUS TERMINAL—Spokane Union Bus Depot Co., c/o S. H. Hawley, 508 W. Cataldo St., Oct. 30, bus terminal, from W. G. Myers, Hyde Bldg. $266,000.

Contract Awarded

Wash., Yakima—PLANT—Pacific Fruit Co., Yakima, cold storage plant addn., to W. M. Yeaman - Yakima. $130,000.

BRIDGEPORT BRONZE

FOR QUICK...LONG LASTING REPAIRS

Good examples of the all around usefulness of brazing are the clutch plate lugs illustrated, which broke off and were replaced by building up new metal with Bridgeport's No. 192 low fuming bronze. Holes were then drilled and threaded.

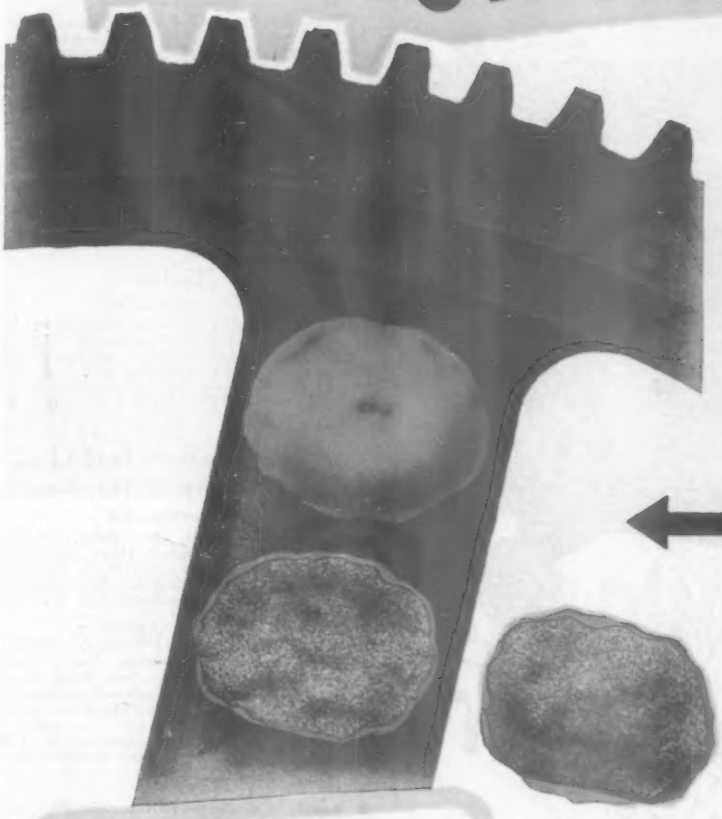
Brazing with Bridgeport bronze is used for repairing both large and small equipment with a minimum of lost time. No elaborate pre-heating or slow cooling is required and dangerous stresses are avoided. Frequently the repaired part is stronger than originally.

Where quick, strong, permanent repairs are needed take advantage of the exceptional adhering properties, good tinning action, and other fine characteristics of Bridgeport bronze welding rod. Write today for a copy of "Bronze Welding Alloys".

"Bridgeport" BRIDGEPORT BRASS COMPANY
BRIDGEPORT 2, CONN. • Established 1865

Bronze Welding Rod A PRODUCT OF
BRIDGEPORT BRASS

Stronger BRONZE WELDS ON CAST IRON



"PETERSON" FLUX ASSURES STRONGEST BOND KNOWN TO BRONZE WELDING—WITH FAST CLEANING ACTION

Using PETERSON No. 3 Special Low Heat Flux, these two bronze buttons were welded to this rusty, greasy gear casting without first grinding or chipping.

PETERSON Flux was wiped over a heated red spot the size of a quarter; then the flame was played over the spot until the scale and oxide were washed off to the side.

Melted bronze was dropped onto the spot where it flowed and penetrated into the pores of the cast iron like water dropped onto a blotter. Bronze was added until the button was ¼ inch high.

Bronze button was knocked off with a chisel held at 30 degree angle. NOTICE LARGE CHUNK OF CAST IRON PULLED AWAY WITH THE BRONZE BUTTON, PROVING THE BOND.

PETERSON FLUXES OF MERIT

No. 1 BLUE—for brazing steel, malleable, clean cast iron. For welding brass, bronze and copper.

No 2. HIGH HEAT—for brazing cast iron at medium and high heat.

No. 3 SPECIAL LOW HEAT—for brazing cast iron at low and medium heat.

No. 5 CAST—for welding cast iron without pinholes or hard spots. Leaves a soft machineable weld.

OTHER PETERSON PRODUCTS

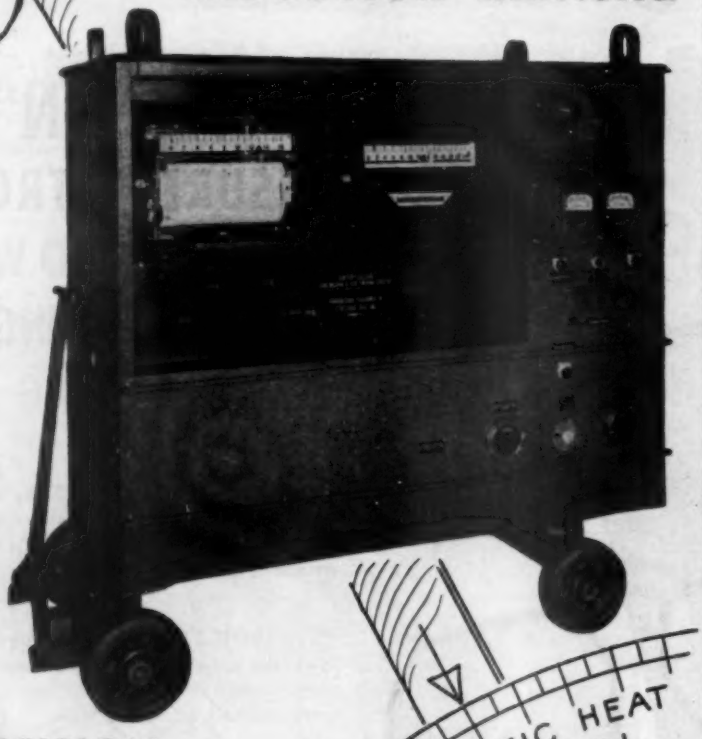
Kerosene Preheaters—Portable 12 gallon tank with two burners.

PETERSON SURFACE GRINDERS for resurfacing cylinder heads, blocks and flat castings. No set-up required. Average warped cylinder head ground true in five minutes.

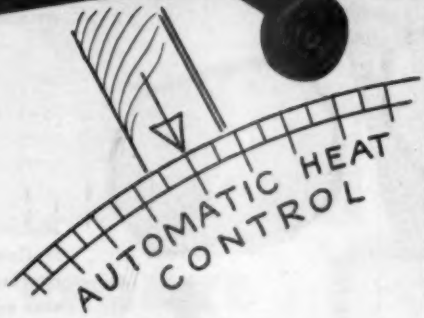
PETERSON WELDING LABORATORIES

1423 VIRGINIA AVENUE — KANSAS CITY 6, MISSOURI

WELDING
MODERN STEELS
BY
MODERN METHODS
DEMANDS
INDUCTION HEATING



60 KVA Model SH
Induction Heater
with Full Heat
Cycle Program
Control and
6 Point Recorder



FOR PRECISION
CONTROL OF
HEAT!

INDUCTION HEATING by the SMITH DOLAN SYSTEM
Plus The New HEAT CYCLE PROGRAM CONTROL
Gives all this and more.—Precision control of PREHEATING
FOR WELDING and NORMALIZING AFTER WELDING
is the only efficient method for joining modern alloy steels.

MODERN — SELF-OPERATING — COMPLETE!

Once the metallurgical heat-cycle for the steel has been determined, it is only necessary to set the controls, and the machine shown above will deliver this program from start to finish! In addition, recorded charts keep permanent records for duplication of results. A complete unit for efficient performance. Temperatures up to 1750° F. readily obtainable.

ELECTRIC ARC, Inc.
152-158 Jelliff Ave. Newark 8, New Jersey

Contract Awarded

★ **W. Va., Parkersburg**—PLANT—American Cyanamid Co., Calco Chemical Div., 30 Rockefeller Plaza, New York, N. Y., 1 and 2 story brick, steel mfg. plant and warehouse and power house at Willow Island, near here, to Turner Constr. Co., 420 Lexington Ave., New York, $3,500,000* chemical equipment plant, at Willow Island, near here, to Rust Eng. Co., Clark Bldg., Pittsburgh, Pa. $2,000,000.

Contract Awarded

Wis., Black Creek—FACTORY—Outagamie Producers Co-operative, Black Creek, 1 story, part bsmnt., 90x109 ft., steel, brick, tile factory addn., concrete fdn., to Ed. H. Meyer Constr., 75 Main st., Oshkosh.

Contract Awarded

Wis., Milwaukee—LAUNDRY, etc.—Milwaukee Childrens Hospital, 721 N. 17 St., Zone 3, 2 story, 63x81 ft., rein.-con. steel, brick, blocks, laundry and power plant, concrete fdn., to Selzer-Ornst Co., 6220 W. State St., Wauwatosa, Zone 13, Est. $250,000.

Contract Awarded

Wis., Reedsburg—FACTORY, etc.—Reedsburg Development Co., Reedsburg, 1 story, 100x300 ft. steel, brick, factory and office bldg., concrete fdn., to F. S. Willis, 326 Hayes Blk., Janesville, Est. $130,000. Moe Bros. Mfg. Co., lessee. Grasshold & Johnson, 734 N. Jefferson St., Milwaukee, Zone 2, archts.

Contract Awarded

Wis., Waunakee—CHEESE FACTORY—Milwaukee Cheese Co., 420 N. Broadway, Milwaukee, Zone 2, 1 story, 60x120 ft. brick, steel cheese factory addn., concrete fdn., to Mike Simon & Son, Waunakee, W. V. Kaeser, 2306 University Ave., Madison, archt.

Rails

Contract Awarded

★ **New York**—SUBWAY EXTENSION—Bd. Transportation, 250 Hudson St., New York, Zone 13, part of Rapid Transit Railroad, Route, 108 Sect. 12, Hillside Ave. from 178 St. to 184 Pl. Jamaica, Queens Co., to Van Wagner Constr. Co., 332 E. 149 St., New York. $5,524,889.

Miscellaneous—Including Eq'p't. Repairs & Hard-facing

Contract Awarded

★ †**Nebraska**—DAM, etc.—Bureau Reclamation, McCook, Enders Dam and dike on Frenchman Creek, Spec. 1410, to Wunderlich Constr. Corp., Jefferson City, Mo. $4,109,927. Bids 9/4. Low bidder reported W.E. Nov., p. 96.

Contract Awarded

★ **N. Y., Idlewild**—AIRFIELD ROAD—Comr. Marine & Aviation, Pier A, foot of Battery Pl., North River, New York, Zone 4, Contr. 2494, grading, drainage and structures for Van Wyck Approach Rd. at Municipal Airport, Contr. 31, to Gull Contr. Co. Inc., and L. G. Defelice & Sons, Inc., 3315 Lawrence St., Flushing. $1,448,485. Low Bidder reported W. E. Nov., p. 96.

Low Bidder

★ **South Carolina**—ROCK SLOPE, etc.—Pub. Service Auth., Moncks Corner, Oct. 31, furnishing, processing, placing concrete or rock slope on dams and dikes of Santee Copper Proj. Schedule 1, rein.-con. in Upper Zone and Schedule 3, rein.-con. in Upper Zone and dumped riprap on filter layer in Lower Zone, from Grannis, Thompson & Street, Charlotte N. C., $2,895,696 and $4,243,159 respectively***Schedule 2, dumped riprap on filter layer in Lower Zone, from J. A. Jones Constr. Co., 209 W. 4 St., Charlotte, N. C., and Diamond Constr. Co., 2801 8 N. E. Wash. D. C., $2,541,950***Schedule 4, dumped riprap on filter layer both zones, from Wright Contr. Co., 504 25 Ave., Columbus, Ga., $3,822,800.

Low Bidder

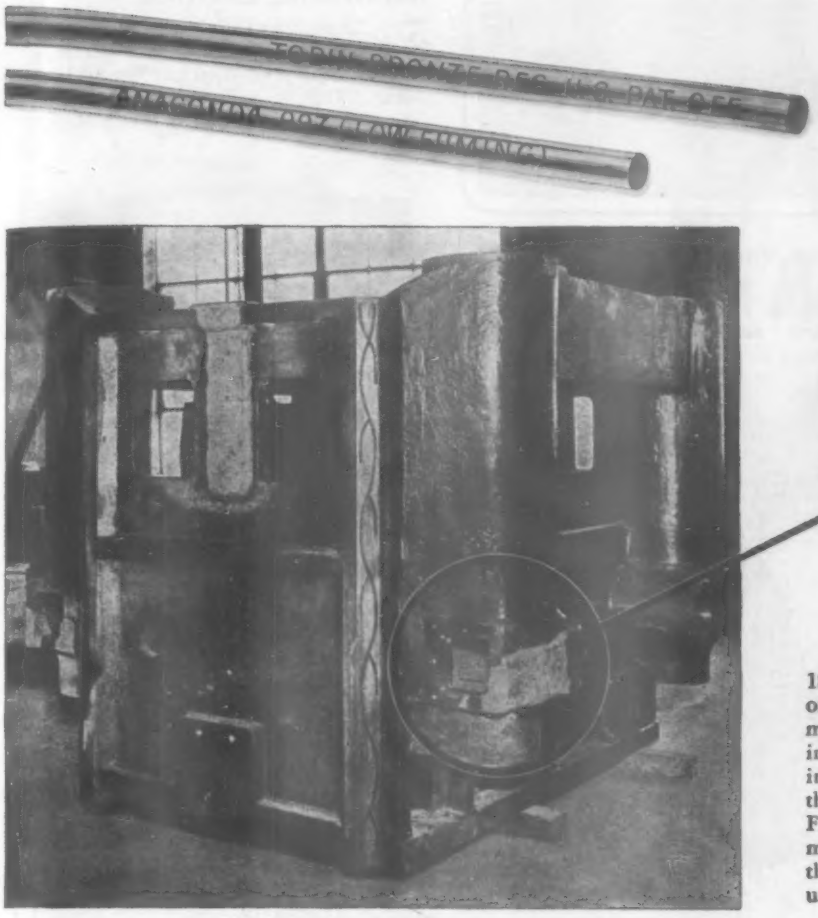
★ **Tex., Houston**—FLOOD CONTROL—City, San Jacinto River Dam (flood control and domestic supply) from Massman Constr. Co., New York Life Bldg., Kansas City, Mo. $7,560,286. Est. approx. $4,500,000. Haile & McClendon, 2801 San Jacinto, engr. W. H. Horner, Shell Bldg., St. Louis Mo., consult. engr.

Contract Awarded

★ †**Washington**—IRRIGATION SYS.— Bureau Reclamation, Coulee Dam, first 12.3 mi. East Low Canal for Columbia Basin Irrigation Sys., Spec. 1422, to Utah Constr. Co., 5250 S. State St., Salt Lake City, Utah, and Winston Bros. Co., 1470 N. W. Bank Bldg., Minneapolis, Minn. $3,977,137. Bids 10/25.

Contract Awarded

★ †**Washington**—DAM—Bureau Reclamation Coulee Dam, 1,900 ft. earth fill dam, 110 ft. high, at Long Lake, to J. A. Terteling & Sons, Inc., 4011 Fairview Ave., Boise, Idaho. $1,770,592. Bids 8/7.



18,500-pound Hydraulic Press Casting • 350 pounds of Tobin Bronze saved this expensive piece of automobile production equipment. Two hydraulic cylinders were repaired as illustrated at the left, and in the close-up above. The casting was received by the Super Arc Welding Company of Detroit on a Friday, and delivered to the customer on Monday morning ready for machining. The Bronze weld in the frame, made several years ago, has stood up under heavy production ever since.

BRONZE WELDING...*First Aid for repairs on big jobs like this*

THE ILLUSTRATIONS above are typical of the equipment on which economical, permanent repairs can be made with Tobin* Bronze, "997" (Low Fuming) and other Anaconda Bronze Welding Rods.

For years this method of low-temperature repair welding has been used for reclaiming broken, fractured or worn equipment, or for building up bearing surfaces. Almost any part made of cast iron, steel, malleable iron or copper alloys can be Bronze welded quickly, dependably, and at a fraction of the cost of new replacement parts.

Publication B-13 will tell you more about Anaconda Welding Rods for oxy-acetylene repair and construction work, and electric welding of copper and copper base alloys. A copy of this booklet will be sent on request.

*Reg. U. S. Pat. Off. 48300

ANACONDA

Anaconda

WELDING RODS

THE AMERICAN BRASS COMPANY

General Offices: Waterbury 88, Connecticut

Subsidiary of Anaconda Copper Mining Company

In Canada: ANACONDA AMERICAN BRASS LTD., *New Toronto, Ont.*

New Products to Use

To Secure Additional Information, Turn to Page 89

Automatic Electrode

1 "Shield-O-Matic" is the name of a new electrode in coil form specifically designed for automatic welding. The core rod is deeply grooved and helically wound with fine wire before being covered with a flux. The metal-grid thus formed is said to permit flexing and bending without loss of flux.

The grid construction of the electrode core extends to the periphery so that the welding current is conducted through the flux coating to the inner steel core. The major portion of the current is conducted through the central area of the core. Each of the fins also conducts welding current, thus creating about the central welding arc an aggregate of miniature arcs that merge with it. Because the electrode and base metal melt at a much faster rate, greater economies and welding speeds are obtained. At low voltage a deep penetration may be had, while high voltage gives a shallow penetration.

One of the principles claimed for the Shield-O-Matic arc is that it operates within a crucible formed by the flux. It is said that for each given diameter of core rod it is important that a given depth of crucible be formed and maintained, as the thicker the flux the deeper the crucible, and vice-versa. While these electrodes can be used in practically all types of welding, present plans call for production of only those electrodes required for welding low and medium-carbon steel and low-alloy, high-strength steels. HOLLUP CORP., Chicago 50.

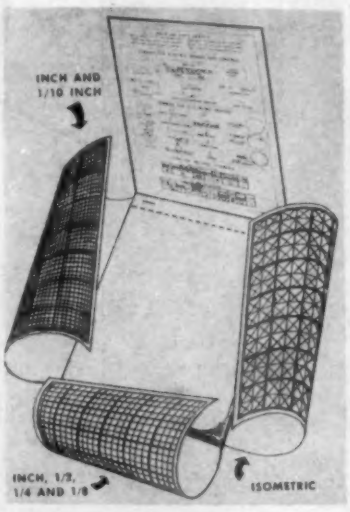
★ ★

Low-Hydrogen Electrode

2 A NEW electrode, "Shield-Arc LH-70," is said to greatly simplify the welding of high-sulphur free-machining steel as well as of certain high-tensile, low-alloy steels. The electrode has a low-hydrogen, low-moisture coating and is designed for use with d-c welders on all positions. The tensile strength of deposits ranges 70,000–80,000 psi, and elongation is 25 to 30%. Welding currents are comparatively high; for example, approximately the same current is used with 5/32-in. LH-70 as with 3/16-in. other all-position electrodes. The range is: 1/8-in. 100–135 amp, 5/32-in. 140–190 amp and 3/16-in. 180–250 amp. A rather short arc is recommended.

In using this new electrode, vertical welds are made from the bottom up. Overhead welds may be made with a narrow lateral weave. The 1/8-in. and 5/32-in. sizes are suitable for vertical and overhead welding and on large welds in thick plate; the 3/16-in. size may be used for vertical and overhead welds. THE LINCOLN ELECTRIC CO., Cleveland 1.

★ ★



"Jiffy Sketch" pad enables scale drawings to be made without a ruler

Drawing Pad

3 "JIFFY SKETCH," a new 9 by 12 in. drawing pad, is said to eliminate the use of a ruler, drafting board or T-square and may be used in the shop or field. The pad contains 75 sheets of tracing tissue enclosed within a cover jacket that has four cardboard flaps. Three of these have various scales. To use the pad, the tissue is placed over the desired scale and the drawing is made with the aid of the printed lines which show through the tissue. Useful drafting information is printed on the back of each cover flap such as basic mechanical drafting standards, electrical welding and architectural symbols, decimals of a foot, decimal equivalents of fractions, circumferences and areas of circles, etc. JIFFY SALES CO., Cleveland 14.

★ ★

Automatic Welding Wire

4 TO SUPPLEMENT Airco manual electrodes, the Air Reduction Sales Co., now introduces a group of automatic arc welding wires and tapes. This new line embraces five knurled type wires and five tapes, all for flat-position automatic welding. Their applications on the production line range from thin-gauge sheet metal forms to boilers, axle housings, torque tubes, etc. The automatic wires may be used separately or in conjunction with the tapes, depending upon the job to be performed. AIR REDUCTION SALES CO., New York City 17.

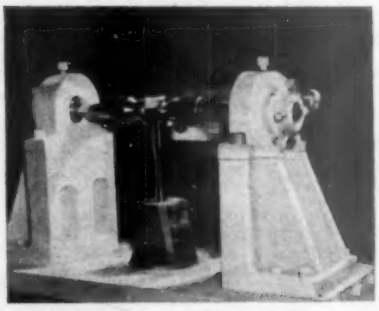
Hard-Facing Electrode

5 "RESISTWEAR" is the name of a new Amsco hard-facing electrode that can be deposited on any ferrous base metal. This is a high-carbon, chrome and molybdenum electrode that will pro-

"Resistwear" hard-facing electrode can be deposited on any ferrous base metal

duce an as-deposited-hardness of approximately 400 to 500 Brinell, depending upon the degree of dilution from the base metal. It may be used wherever desirable to protect ferrous parts subjected to severe abrasion (with or without impact) with an overlay of a resistant material and is said to be an excellent substitute for manganese steel parts or abrasion applications. This electrode is available in 1/8, 5/32 and 3/16 in. sizes, 14 in. long. AMERICAN MANGANESE STEEL DIVISION OF AMERICAN BRAKE SHOE CO., Chicago Heights, Ill.

★ ★



Fatigue machine simulates actual working conditions by vibrating metal parts

Fatigue Tester

6 A NEW instrument uses a pneumatic resonant principle to fatigue test specimens by vibrating the work at its own resonant frequency, closely simulating the actual dynamic loading conditions. It uses an opposed cylinder-type driving mechanism to vibrate the test specimen, which is attached to two pistons located between the openings of the two opposed cylinders. Highest displacement of vibration is obtained by adjusting the driving mechanism until the frequency of the pressure impulse is the same as the natural frequency of the specimen. The machine will continue to vibrate until failure occurs. A furnace which permits testing at temperatures up to 1,700 F is offered as optional equipment. GENERAL ELECTRIC CO., SPECIAL PRODUCTS DIVISION, Schenectady, N. Y.

Abrasive Wheels

7 RECOMMENDED for postweld finishing and for grinding aluminum castings, the "Bayflex" raised hub disc

"Bayflex" raised hub disc abrasive wheels may be used on any standard grinder

abrasive wheel fits any standard grinder and is available in standard grit sizes. Bayflex discs may be used efficiently right down to the nut, claims manufacturer. BAY STATE ABRASIVE PRODUCTS Co., Westboro, Mass.

* *

Brazing Flux

8 "ELITE" aluminum brazing flux has been developed to meet the demand for an economical flux with a satisfactory low-melting point. With this new flux, Airco No. 26 Wire, widely used for general-purpose welding, is made available for brazing 2S, 3S, 53S and 61S aluminum. Alcoa No. 716 brazing wire is also recommended for brazing 53S and 61S aluminum alloy analyses. AIR REDUCTION SALES Co., New York City 17.

* *

Frequency Computer

9 THE "CALCULAIDE" pocket size frequency provides quick slide-rule solutions of complicated mathematical problems involving frequency, inductance and capacitance in resonant circuits. The disc-type computer covers frequencies from 400 kilocycles to 150 megacycles, wave lengths from 2 to 600 meters, capacitance from 3 to 1,000 microfarads and inductances of from 0.1 to 1,500 microhenrys. It measures 6¼ in. in diameter and is made from three sheets of non-warping "Vinylite" plastic. All of the markings are heat-sealed into the body of the plastic. AMERICAN HYDROMATH Co., New York City 19.

"Calculaide" frequency computer solves problems involving capacitance and inductance

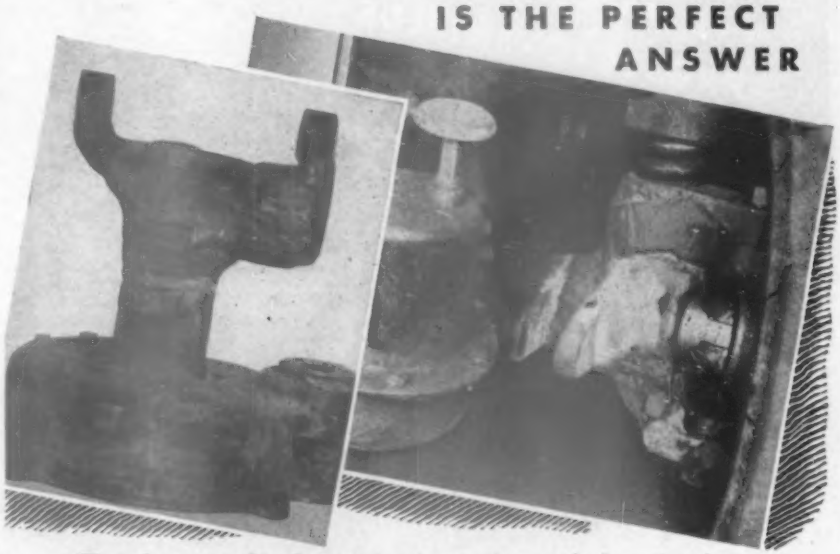
WHEN YOU CAN'T GET NEW PARTS

REPAIR WELDING WITH

TITAN

Bronze Welding Rods

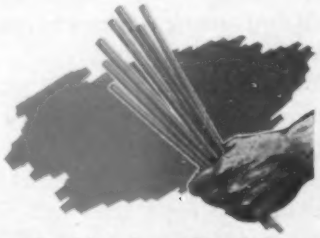
IS THE PERFECT ANSWER



The photographs show two views of an axle housing from an old Mack truck which was used during the war years. The housing had broken in three places, and, since the truck was several years old, a replacement part was not obtainable. Even the pattern for making the housing had been discarded by the manufacturer.

By using TITAN Manganese Bronze Welding Rod, repairs were quickly made and the truck was soon back on the road hauling vital supplies. The bronze welds proved even stronger than the original cast iron.

When you can't obtain new equipment parts, or when deliveries are slow, repair welding with TITAN Bronze Welding Rods is the perfect answer to your problem. Even when new parts are quickly available, repairs with TITAN Bronze Welding Rods will usually save you money.



TITAN bronze welding rods are doubly deoxidized by a patented process to produce ductile, strong, non-porous welds. Complete information on request.

TITAN Metal MANUFACTURING CO.

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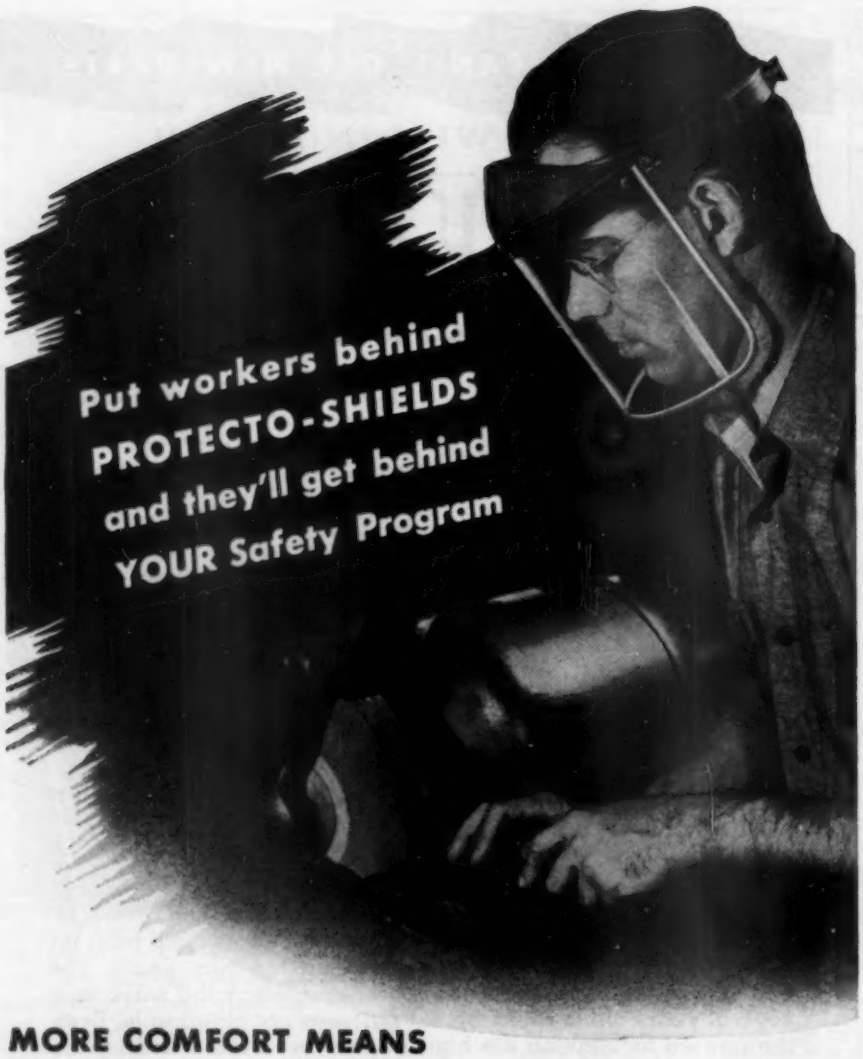
Brass and Bronze Rod · Forgings · Die Castings · Welding Rods



MORE COMFORT MEANS
EASIER ENFORCEMENT OF SAFETY REGULATIONS

The more comfort in the eye protection equipment you buy—the more willingness you'll find among workers to cooperate with your eye safety program.

For light grinding, wood working, spot welding and similar light duty operations, Willson Protecto-Shield* gives adequate protection. At the same time, its light weight, its cushioned headband and full visibility permit wearing all day without fatigue.

The visor, with rigid aluminum binding, is made of clear or Willson Tru-Hue green impact resisting plastic. Slot locks hold the visor securely in place and allow easy replacement. The headband is easily adjustable for all head sizes and a tough fibre guard protects the forehead area.

When not in use, the visor tilts up and "stays put."

Protecto-Shield comes in three lengths: 8", 6" and 4". Also available with side wings for protection against chemical splash.

For help with your eye and respiratory protection problems, get in touch with your Willson distributor or write direct.

GOGGLES • RESPIRATORS • GAS MASKS • HELMETS
DOUBLE WILLSON
PRODUCTS INCORPORATED
Established 1870
227 WASHINGTON STREET, READING, PA., U.S.A.

*T. M. REG. U. S. PAT. OFF.

X-ray Diffraction Camera

10 A NEW micro X-ray diffraction camera permits the study of minute sections and the charting of changes over microscopic areas. It comprises a precision-machined body designed to fit the "Norelco" X-ray diffraction unit. Two specimen holders and a special film cassette with beam stop are provided. NORTH AMERICAN PHILIPS CO., INC., New York City 17

* *

Bending brake for forming small parts of materials up to 16-gauge sheet steel

Bending Brake

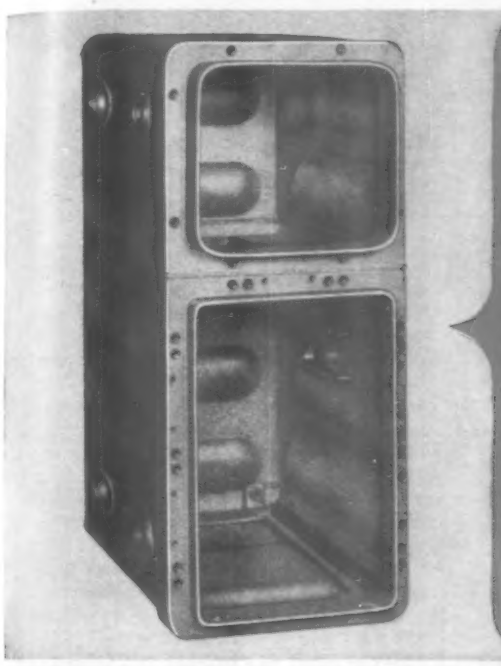
11 A NEW bending brake, "Di-Acro No. 4," has a capacity of 16-gauge sheet steel in 24-in. forming widths. Features include: (1) a material-clamping action that makes possible extremely sharp bends; (2) a double-edge vertical folding plate that allows close reverse bends to be formed; and (3) changeable contact surfaces that makes it possible to form shapes and outlines usually impracticable with production dies. O'NEIL-IRWIN MFG. CO., Minneapolis 15.

* *

Tensile Tester

12 A NEW portable tensile-testing machine has been developed to test weldments, wire, castings, copper, copper springs and steel in loads up to 10,000 lb. W. C. DILLON CO., INC., Chicago 44.

Tensile tester for weldments, wire, etc.



How WELDING SOLVED A HOUSING PROBLEM

One of a series of case histories demonstrating the adaptability of the G-E Inert-Arc process to the solution of difficult welding problems.

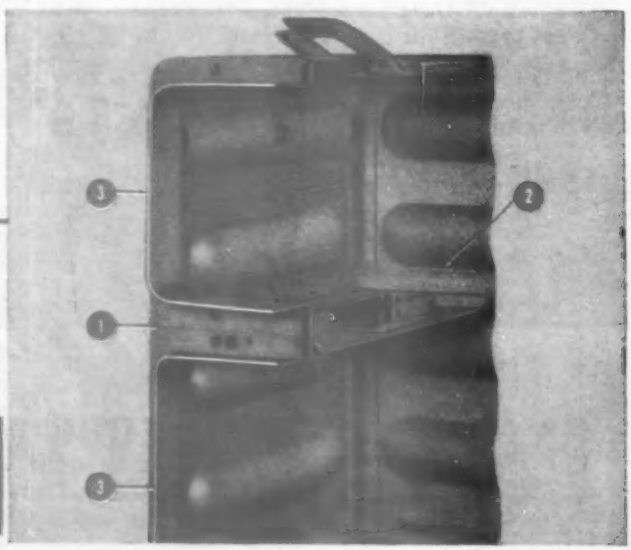
This aluminum radio-housing was successfully welded by the INERT-ARC process — WITHOUT FLUX!

The Problem—To fabricate, on a production basis, *watertight* aluminum cases for naval radio equipment. Welding seemed the most logical solution, but there were several types of "difficult" joints, some so located that they could not be cleaned effectively on the under side. Thus, in addition to being absolutely watertight, the welds had to be made *without the use of any flux whatsoever.*

The Solution—Investigation demonstrated that this job could be successfully welded using the G-E Inert-Arc process. (Inert-Arc welding is particularly adapted to light-gage and other so-called "difficult" metals—aluminum, cold-rolled steels, copper and special alloys, stainless, etc.)

Six equipments were designed for the application, each utilizing the small, light-weight G-E Type WGS electrode holder to facilitate reaching the difficult joints inside the case. In short order, the housings were being successfully production welded—each with approximately 43″ of lap joints, 75″ of edge welds, and 140″ of butt joints.

Results—An improved housing was produced in less time and at lower cost—those ever desirable advantages. Perhaps you can enjoy some or all of them in a welding operation of your own; your nearest G-E Arc-welding Distributor is eager to demonstrate how! *Apparatus Department, General Electric Company, Schenectady 5, N. Y.*



This cut-away view gives only a suggestion of some of the difficulties involved.
1. **Butt weld**
2. **Interior lap weld**
3. **Edge weld (watertight)**

Resistance spot welding was also used.

GENERAL ELECTRIC

Spray Welder

13 A GUN-TYPE powder metallizing unit offered by Wall Colmonoy is said to combine the advantages of both welding and metallizing. The powder-welding process is first used to apply a uniform overlay of alloy, and the "Spray-welder" is then used as a welding torch to fuse the sprayed overlay to the base metal. The complete spray welder consists of the gun, necessary hoses and a panel to hold all the equipment. There are only two control valves, and the hopper for the powdered metal and carburetor are combined in a single unit. Once adjusted, the powder flow may be stopped and started by pressing or releasing the trigger. Well balanced and light in weight, the unit may be hand operated or held in a vise for automatic applications. WALL COLMONOY CORP., Detroit 3.

Colmonoy 'spray welder' combines the advantages of welding and metallizing

* *

Hard-Facing Electrode

14 Two new high-carbon electrodes are offered for building up worn steel parts by the a-c welding process. These electrodes have a heavily extruded shielded-arc coating and produce flat, smooth deposits that can be hot-forged. The a-c types are designated as "Hardweld a-c" and "Hardweld 100 a-c" to distinguish them from the present "Hardweld 100" and "Hardweld 50," which operate on d-c only. The new a-c types produce a dense, tough surface of moderate hardness to resist shock and abrasion.

"Hardweld 100 a-c" has a hardness of deposit of 20 to 45 Rockwell C when the metal is allowed to cool naturally. "Hardweld 50 a-c" deposits cool naturally to 20 to 35 Rockwell C hardness.

Size and current ranges of "Hardweld 100 a-c" are: 1/8 in., 70–110 amp; 5/32 in., 105–170 amp; 3/16 in., 145–230 amp and 1/4 in., 215–350 amp. There are two sizes of "Hardweld 50 a-c": 3/16 and 1/4 in. with the same current range for each as "Hardweld 100 a-c." THE LINCOLN ELECTRIC CO., Cleveland 1.

* *

Eye Goggles

15 "EYE GUARD CHAMPION" goggles number 3 for grinding and chipping operations and number 36 for weldors are made from a light but impact-resisting plastic molded to fit the contours of the face. Nine ports around the lenses provide ventilation where it is most needed, eliminating the usual tendency to fog. These goggles may be readily recognized by means of their mahogany color. AMERICAN SAFETY EQUIPMENT CO., Brooklyn.

* *

Induction Heater

16 THE new "Ther-Monic" M-285C electronic induction and dielectric generator is suitable for operating as an induction heater for such purposes as heat treating, thin case hardening, brazing, forging, melting and soft soldering. This combination generator is provided with two separate, interchangeable oscillator sections. The induction oscillator feeds into a radio-frequency output transformer, while the dielectric unit feeds through coaxial cables to heating electrodes. INDUCTION HEATING CORP., New York City 3.

* *

Hard-Facing Electrode

17 CHAMPION "C-30" electrode has been developed for building up worn surfaces on shaftings, pins and bushings. The deposited metal has good wearing qualities and yet is said to be readily machinable. In many applications the use of this electrode will save dismantling of the entire equipment to replace worn parts. THE CHAMPION RIVET CO., Cleveland 5.

Marquette Instant Arc Welders are designed to give you maximum welding performance on all jobs from light sheet metal to heavies welding and hardsurfacing jobs. On low amperage sheet metal welding, Instant Arc Striking makes it easy to strike and hold the arc for better, faster welds. On highest heats, the Automatic Voltage Control reduces spatter and assures the best arc.

Models 262 C, has built-in Capacitor for High Power Factor. Newly designed transformer gives Instant Arc Striking without the use of high frequency or booster gadgets. Telnic Bronze plugs and sockets double current carrying capacity on high heats. All models truck mounted and fully equipped. Models: 262 and 262 C, 20–275 amps.; 261 and 261 C, 20–200 amps. Write for literature.

MARQUETTE WELDING EQUIPMENT
SOLD EXCLUSIVELY THRU THE
NATION'S LEADING DISTRIBUTORS

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REGISTERED U.S. PAT. OFFICE
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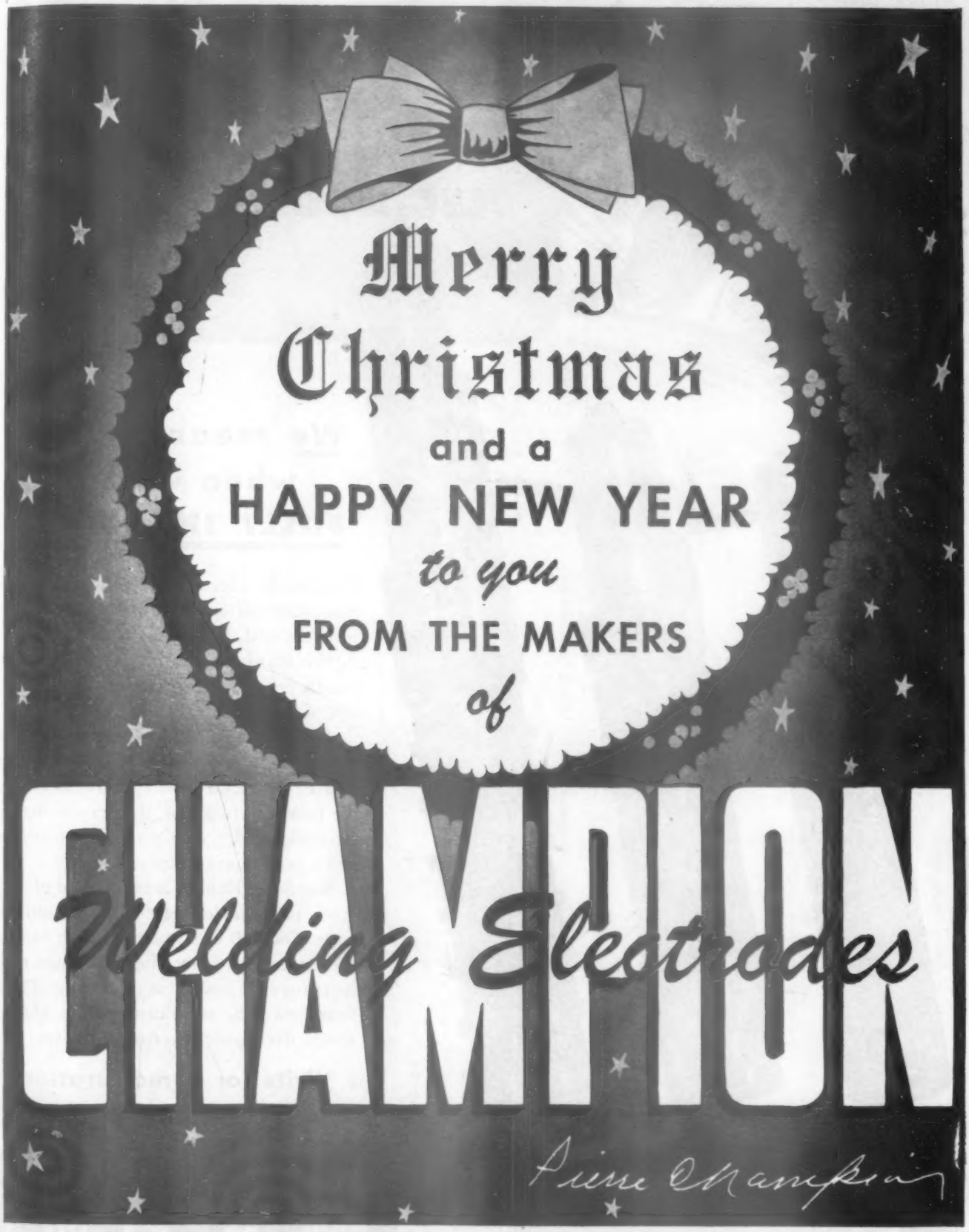

THE CHAMPION RIVET CO.

CLEVELAND, OHIO ★ East Chicago, Indiana

Rod Saver
ELECTRODE HOLDERS

CUB

The handy Cub is for lightweight operations. The sturdy, compact Cub has a capacity through 180 amps. It is 8¼" long and weighs only 11 oz.

STUBBY

The general purpose Rod Saver for all operations where a capacity through 300 amps. is desired. Stubby handles electrodes to ¼". 8¾" long and weighs only 16 oz.

MASTER

The heavy duty Rod Saver—400-500 amp.—operates with 5/16" electrodes under sustained welding conditions. Weighs only 19 oz., is 10½" long.

We mean 100% when we say FULLY INSULATED

Rod Saver Electrode Holders provide maximum safety through their freedom from arc and flash. The distinctive design of the sturdy insulator cap, sleeve and handle provides all conductor surfaces with 100% insulation.

All Rod Saver Holders are composed of copper alloy and designed in such a way that all the metal parts lend themselves to the transfer of current, thus producing an electrode holder with a minimum weight and a maximum of current capacity.

Rod Saver Holders are composed of only seven parts, including only two insulator parts. The 400 to 500 amp Master weighs 19 ounces. Rod Saver Holders require one-fourth or even less maintenance time. These facts prove the superiority of the Martin Wells Rod Saver Electrode Holders.

Write for demonstration

Get More Efficient Arc Time

Get More Efficient Arc Time

Martin Wells

INCORPORATED

5886 Compton Ave.

Los Angeles 1, Calif.

TRADE NAMES* OF ELECTRODES AND COMPARABLE AWS-ASTM DESIGNATIONS

Designation	E-4510	E-4511	E-4520	E-6010	E-6011	E-6012	E-6013	E-6020	E-6030	E-7010	E-7020	E-7030
Weld positions	V, F, OH, H	F, V, OH, O	H, Fillet, F	F, V, OH, H	F, V, OH, H	F, V, OH, H	F, V, OH, H	H-Fillet, F	Flat	V, F, OH, H	H-Fillet, F	Flat
General Description	Wire—coating applied before drawing	Wire—light coating after drawing	Wire—coating before drawing	Heavy coated D-C positive	Heavy coated A-C or D-C	Heavy coated D-C negative or A-C	Heavy coated A-C	H. coated A-C or neg. for fillets, A-C or pos. flat	Heavy coated D-C pos. or A-C	Heavy coated D-C pos. only	H. coated A-C or neg. for fillets A-C or pos. flat	Heavy coated D-C pos. or A-C
MANUFACTURER												
Air Reduction[1]	41 or 63	63 or 44		78E or 79E	230	87	90 or 90A	81 or 365		93	94 or 385	
Allis-Chalmers				E-6010	E-6011	E-6012	E-6013A, E-6013 or E-6013GP	E-6020	E-6030	E-7010	E-7020	E-7030
American Agile				White	Blue	Red-White	Blue-Red	Blue-Grey		Orange	Black-White	
Anthony Carlin[2]	P-170 or P-180			P-50X	P-103	P-60 or P-61	P-100	P-70 or P-81		Moly-C-Alloy 1	Moly-C-Alloy 2	
Central Steel	Sul 18	Steelkote 18	Speedox D.08	White Flash B	White Flash E				White Flash C	White Flash D		
Champion	Sulcoat	Processed	44	Blue Devil	Bluedac	Gray Devil Gray Devil 2	Graydac	Black Devil	Red Devil Black Devil	Blue Devil 85	Black Devil 75	Red Devil 75
General Electric	L	F, H, M or W-4	W-3	W-22 or W-22H	W-26	W-20 or W-30	W-25	W-24 or W-27		W-52	W-54 or W-57	
Harnischfeger	Litecote	Dustcote		AP	AC-1	PF or FR	SM or AC-3	DH-2			CM-50-2 or Chromoly-72	
Hobart	Sulcoat			55	AC-55	77	AC-77	111		885		111 HT
Hollup	Hollup 30 or 3	Hollup 30-S	Hollup 30-A	Sureweld B	Sureweld CB	Sureweld N	Sureweld CN or UW	Sureweld F	Sureweld A	Sureweld MLY-50	Sureweld MLY-A	
Lincoln		Stable-Arc Swiftweld		Fleetweld 5	Fleetweld 35	Fleetweld 7	Fleetweld 37 or 47	Fleetweld 11	Fleetweld 9	Shieldarc 85	Fleetweld 11HT	
Marquette		No. 101		No. 31	No. 151	No. 25	No. 151	No. 33 Hot-Rod		No. 75		
McKay	21		3	15	11	17 or 116	14	16	18	715	716	
Metal and Thermit				Murex Vertex	Murex Alternex or Type U	Murex Genex or Genex C	Murex Type A	Murex Fillex, Type FHP or F		Murex Molex	Murex Type M or Carbon-Moly .50	
Page	B Rust Lime			Hi-Tensile C		Hi-Tensile F or G	Hi-Tensile AF or G					
Reid-Avery[3]	D or Blue Label		D or Blue Label	7	11	8	13	20	5	74	64	
A. O. Smith				SW-10	SW-14	SW-11	SW-15 or 16	SW-35	SW-20	SW-75	SW-73, 76 or 78	
Westinghouse	18 Sulcoat			AP	ACP	FP, SW or SW-2		DH		AP-MO	DH-MO	
Wilson	17 or 18	17 Dipped Coat or 18		98N, 98N V & O	530	107 or 108	520 or 520A	105 or 106		Alloy Rod A	Alloy Rod B or 585	

* Trade name or Type No. is usually prefixed by company name.
V = vertical, F = flat, OH = overhead, H = horizontal, H-Fillet = horizontal fillet. [1] Airco prefix. [2] Perfection prefix. [3] Raco prefix.

FASTER, EASIER HARDFACING ...wrapped up in the NEW STOODY SELF-HARDENING COATING!

HERE'S NEWS for owners and operators of earth-working and processing equipment . . . *a new extruded coating on Stoody Self-Hardening brings even improved results over the old, time-tried and proven favorite* . . . speeds up welding, assures denser deposits, eliminates porosity! The new extruded coating has far greater strength than dipped coatings—has less tendency to pick up moisture and is completely uniform!

AC-DC APPLICATION. Excellent arc characteristics with *either* AC or DC machines over wide range of amperages.

SELF-LIFTING SLAG when deposits cool—easy removal while still hot.

ANY DESIRED BEAD TYPE can be welded.

NO SLAG INTERFERENCE

CAN BE WELDED IN ALL POSITIONS

FIRM BONDING with manganese steels as well as other types of steel.

In addition to all these advantages, Coated Stoody Self-Hardening retains all its original hardness and wear resistance. Proved and accepted for 20 years as the leader in wear protection—Now additionally improved for ease of welding!

Available from over 600 U. S. Distributors in 1/8", 5/32", 3/16" and 1/4" diameters. No change in price!

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Retard Wear Save Repair

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TO BRING YOUR LIBRARY UP-TO-DATE ON

LITERATURE AND NEW PRODUCTS

Manufacturers' Literature as well as further information on New Products described in this issue are important "working tools" for design and production departments. To make it easy to keep up-to-date, THE WELDING ENGINEER will request manufacturers to send readers the literature in which they are interested. Just fill out card—we do the rest.

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In the event this copy of THE WELDING ENGINEER is passed along to other members of your company *please* leave this sheet in for their convenience. This assures everyone in your plant the opportunity to fill in their requests. When the round is completed, cards can then be detached along perforated lines and dropped in the mail. Each individual request will be mailed by us to the company offering the information.

Write in circle number of item describing one catalog wanted → ○

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Chicago, Illinois
Your Name John Smith
Your Title Chief Engineer

THE WELDING ENGINEER
520 No. Michigan Ave., Chicago 11

CARDS NOT GOOD AFTER MARCH 1, 1947

18 STAINLESS TUBING CALCULATOR—The Carpenter Steel Co., Kenilworth, N. J. An 8½ by 4 in. slide-selection chart gives information at-a-glance on the physical properties of Invar and eleven AISI type numbers of stainless tubing. One setting provides data on the analysis range, tensile properties, Rockwell hardness, specific gravity, coefficient of expansion, electrical resistance, structure, magnetic characteristics, maximum scaling temperature for continuous service and thermal conductivity of the particular alloy selected. The opposite side of the chart is used to find such data as cross-sectional area of OD and ID, square feet of internal and external surface per lineal foot of tubing, mass velocity constant and velocity constant for wall thicknesses of 18 to 12 gauge diameters of ⅜ to 2 in.

19 OVERLAY ELECTRODES—Sight Feed Generator Co., Richmond, Ind. 4-page bulletin contains complete data for six "Rexarc" overlay electrodes for the replacement of worn metal on machinery parts. These electrodes have coatings which are composed of chromium, nickel, copper, vanadium, manganese and other metals that blend with the core rod during welding. The characteristics and applications of each type of electrode are fully described in the bulletin.

20 SEAM WELDERS—Progressive Welder Co., Detroit 12. 8-page bulletin (NO. 803) contains information on the design, operation and applications of standard and special seam welders made in light, medium and heavy-duty sizes. Each size is available in three different types: circular, longitudinal and universal. These are built with five methods of driving the seam-welding wheels: (a) upper gear, (b) lower gear, (c) upper knurl, (d) lower knurl and (e) upper and lower knurl. Typical applications pictured include the welding of a cylindrical cup to a flat circular plate; welding gas tanks; welding the longitudinal seams of 22-gauge steel tubes at a speed of 15 ft per minute.

21 HARD-FACING ON THE FARM—Industrial Overlay Metals, Inc., Chicago. 11 multigraphed sheets illustrated with diagrams explain the use of hard-facing electrodes for the repair of farm equipment. Recommended procedures are given for building-up and surfacing such implements as plows, landsides plates, plow moldboards, thresher teeth, mill hammers, lister shares, corn planter shoes, cultivator shovels, etc.

22 ARC WELDING FOUNDATION—The Lincoln Electric Co., Cleveland 1. 4-page pamphlet summarizes the organization, purpose and activities of the $200,000 James F. Lincoln Arc Welding Foundation and tells how the papers received are made available to industry in the welding library at Ohio State University.

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23 COLOR CONDITIONING—E. I. duPont de Nemours and Co., Inc., Wilmington 98. 32-page booklet "Du Pont Color Conditioning for Industry" illustrates and describes the new methods of using color to increase production, improve seeing conditions, save worker's eyes and warn against specific hazards in industrial plants. The "Three-Dimensional Seeing" treatment of machines is shown with colored photographs of actual installations. A two-page cutaway drawing of a model plant illustrates the functional principles of the new color dynamics.

24 SURFACE GRINDER—Peterson Welding Laboratories, Kansas City, Mo. 4-page booklet describes model "1A" surface grinder for cylinder heads and castings of average size. Information is given with respect to construction and operation of the unit. Grinder "2A" for large, bulky castings is also mentioned.

25 FLAME-CUTTER—Indiana Oxygen Co., Indianapolis 6. 24-page bulletin (No. 15) describes the portable oxy-acetylene flame-cutter "Cut-A-Line," model 1,000. Information includes construction and operating data, use in straight-line and circle cutting, price schedule and parts list and several pages of helpful cutting hints.

26 ASA YEARBOOK—American Standards Association, New York City 17. 1945–46 year book contains new material of value to engineers, executives and technical students. Center section of the book is devoted to a listing of approved American standards under development.

27 SAFETY GUIDE—American Optical Co., Southbridge, Mass. This booklet classifies 21 hazardous types of work found in 18 different industries and includes pictures and descriptions of the different types of safety clothing which should be worn to protect the body against each hazard.

28 HARD-FACING ALLOYS—Resisto-Loy Co., Grand Rapids 7, Mich. 4-page bulletin tells how to select the proper alloys for hard-facing different metals and explains which metals can and cannot be hard-faced. Tables list the properties, welding characteristics, etc. of the various Resisto-Loy alloys. A guide to the selection of the hard-facing materials concludes this bulletin.

29 MACHINE AGE HISTORY—DoALL Co., Des Plaines, Ill. An 18 by 25 in. wall chart presents an interesting pictorial summary of developments from the first use of fire and the cave man's stone implements to the beginning of the machine tool age with Eli Whitney, circa 1800.

30 GANTRY CRANE—Industrial Equipment Co., Chicago. 4-page bulletin (PG-648) describes the uses and features of a portable industrial gantry crane that has its structural steel legs welded in a jig to assure exact squareness. This crane can be dismantled and folded into a compact space for storage or shipment. Six other types of cranes—jib, push-type, hand-geared, motor-driven and double girder are also illustrated.

31 WELDING GOGGLES—Eastern Equipment Co., Willow Grove, Pa. 4-page color bulletin (Catalog section AWP-50) describes the "Spectra Goggle," a product being offered in many sizes, shapes and designs for use during welding or grinding and chipping operations.

32 PRESSURE GAUGES—Wit Gauge Co., Eau Claire, Wis. 16-page bulletin introduces a line of improved pressure gauges made for oxygen and acetylene cylinders and other devices. Information is given regarding the manufacture, installation and use of these various gauges illustrated in the booklet. A table of standard graduations lists graduations and figure intervals for each of the gauges mentioned in the test.

33 PRESSURE VESSEL DESIGN—Lenape Hydraulic Pressing & Forging Co., West Chester, Pa. 4-page bulletin (4-61) illustrates the range of press-forged welding necks, nozzles, manways and hand-holes produced for pressure vessels. Included are all of the standard and many of the typical, special types of connections and openings used in pressure vessel fabrication. The welding necks are designed for high-temperature, high-pressure and corrosive services.

34 BRUSH KIT—The Ohio Carbon Co., Cleveland 11. A small folder covers the details of the magneto brush kit No. 8. Information contains the various numbers, types, brushes required and the magneto type it fits.

35 PIPE AND FITTING CHART—Tube Turns, Inc., Louisville 1. Time-saving chart of Pipe and Fitting Materials deals with carbon, intermediate alloy, stainless and special-analysis steels for piping and covers welding procedures, ASTM specifications, chemical analyses, service limitations, etc.

36 AMERICAN STANDARDS LIST—American Standards Association, New York City 17. Catalog of a revised list of standards includes 845 definitions of technical terms, specifications for metals and other materials, dimensions and safety provisions for the use of machinery.

37 REFINING PROCESS—The M. W. Kellogg Co., New York City. 12-page booklet describes the "Fluid Catalytic-Cracking Process" for the oil refinery field.

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Although similar in physical characteristics to No. 520, Wilson No. 520A has been designed for use on chrome-moly where extremes in tensile strength after heat treating are not required. This electrode also proves its versatility as an all-position rod on thin mild steel. The arc is spray type, yet adaptable for thin parts because of its light penetration. Its ease of operation is particularly noticeable in vertical and overhead positions.

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WE

News of the Industry

Adopt New Process to Flame-Cut Stainless

A METHOD by which stainless-steel plate can be satisfactorily flame-cut is now in regular use at the Lachine plant, near Montreal, of the Dominion Bridge Co., Ltd., Canada. This method consists, simply, of introducing a flux into the stream of cutting oxygen to remove the refractory chromic oxides that are ordinarily produced when stainless steel is being flame-cut. The flux is injected at a predetermined rate, and it removes the oxides at a temperature comparable to the melting point of mild steel. Quality cuts with but a small amount of loosely adhering slag are thus produced.

This new system was developed by the Air Reduction Sales Co., New York City, and is known as the flux-injection method. It was first used by Dominion Bridge Co. to cut semicircles of 56-in. radius from Type 316 stainless plate of ¼-in. thickness. This work was performed at a cutting speed of 13 in. per minute.

Investigations conducted by the Dominion Bridge research department indicate that the stainless quality of stabilized stainless steel was affected to a depth of only a few thousandths of an inch from the cut edge. Somewhat similar results were obtained in unstabilized steel, but it was necessary to use supplementary equipment in order to reduce the "damaged zone" to the minimum.

* *

Discuss Distributor Problems at NWSA Semiannual Meeting

WELDING distributors from Maine to Texas attended the semiannual meeting of the National Welding Supply Association, held in Cedar Rapids, Iowa, November 8 and 9. Around 60% of the association's members attended the two-day session to discuss such subjects as the coöperation between distributors, standardized catalogs, fair discounts and ways of advancing uses of welding. Another highlight of the meeting was a presentation by George H. Ohmer, executive secretary, based on the results of a survey made to find out what distributors are thinking about.

Officers of the NWSA are: L. O. Schneiderwind, president, Omaha, Neb.; Ralph E. Chase, Sr. vice-president, Benton, Ill.; V. S. Rice, vice-president, Charleston, W. Va.; W. R. Boyd, vice-president, Erie, Pa.; W. J. Bently, vice-president, Milwaukee, Wis. and H. G. Weiler, secretary-treasurer, Dayton, O.

* *

Study German War Process for "Press Welding" Aluminum

BETTER radiators for automobiles and airplanes may result from a study of three items of German equipment brought to this country by the Office of Technical Services, Department of Commerce. These include a machine for making aircraft intercoolers by "press welding" aluminum sheets and two types of machines for forming aluminum radiators.

Use of the press-welding apparatus in radiator manufacture was developed by the Adam Opel automobile factory in Russelsheim. A sheet of aluminum, 0.4 mm (10.016 in.) thick, is folded to make two layers and placed between matching dies in a 400-ton press. Before pressure is applied, the folded sheet is heated to more than 800 deg F, well toward the melting point of aluminum (about 1,200 deg F). The two layers of aluminum are then squeezed together to weld the seams where the ridges of the dies coincide. While the dies are held together, a blast of hot air is forced through the openings between the ridges of the dies under a pressure of 300 psi. The metal swells out into the hollows of the dies and forms a series of tubes. A complete press cycle takes about 40 seconds.

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Carnegie-Illinois Plays Host to 15,000 Guests

GATES of the Carnegie-Illinois Steel Corporation's Gary Sheet and Tin mill were recently opened for inspection by the general public in a gigantic "Open House" that was attended by over 15,000 visitors. These included workers' families, city, state and county officials, members of the general public and representatives of the press—all of whom were given the opportunity to view the spectacular conversion of flaming white slabs into hot-rolled and cold-rolled sheets. A comprehensive exhibit of manufactured products at the end of the tour impressed upon the visitors how much of our present civilization depends upon steel.

Annual capacity of the Gary mill is 1,000,000 tons of sheets and 528,000 tons of mill products. It employs 7,500 workers and includes 110 acres of buildings. Principal products are hot and cold-rolled sheets, including stainless; galvanized and terne plate; tin-coated and black sheets and plate.

* *

Uses Plane to Contact Hard-Facing Distributors

BELMONT D. SMITH, vice-president and sales manager of Industrial Overlay Metals, has solved the problem of contacting distributors scattered throughout the United States, Canada and Mexico by buying a new Stimson Voyager four-passenger airplane. Mr. Smith's firm, which manufacture the Bergstrom line of hard-facing electrodes and alloys, has offices in Chicago and Reno, Nev., and a new Ohio plant under construction. The company has also greatly expanded its sales and service forces, making it necessary for Mr. Smith to find a quicker means of transportation than train or commercial airlines.

* *

Produce Color Movie of Electric Arc Furnace

A 15-MINUTE movie "Melting of Huron Die Steel," produced for the Allegheny Ludlum Steel Corp. at its Dunkirk, N.Y. plant, reveals the true changes in color of the molten steel and slag within an electric arc furnace. Utilizing a telephoto lens, the camera was able to create the impression of being inside the furnace during the melting process.

"Corrosion," another Allegheny film available for free showing, contains an explanation of the mechanism of corrosive attack and how it is thwarted by stainless steels.

* *

List 37,000 Ways for Making Money

OFFICE of Alien Property is now offering for $10 a 4,000-page book detailing 37,000 ways of "making money." The book summarizes all of the mechanical and electrical patents of enemy nationals which were seized by the United States during the war, most of which are available to American business on a royalty-free, non-exclusive-licensing basis. To obtain a copy, address the Office of Alien Property, Department of Justice, Washington 25, D.C.

* *

National Cylinder Builds Georgia Oxygen Plant

A NEW oxygen producing plant has been built by National Cylinder Gas Co. at 471 Peters St., S.W., Atlanta, Ga. The plant includes a modern sales office, display and shipping room. J. D. Williams has been appointed sales manager of these facilities.

* *

Kansas Firm Enters Oxy-acetylene Field

A NEW Kansas plant for the manufacture of oxygen and acetylene has been opened at Hutchison, Kansas by Orville Dowzer and associates. Mr. Dowzer served in a Seabee battalion during the war and prior to that was head of the Dowzer Construction Co., which built electric transmission lines in the central part of the United States.

The new firm, the Kansas Oxygen Co., will supplement its manufacturing activities by acting as a distributor of many nationally known welding products in both the oxy-acetylene and arc fields. Officers are: Orville Dowzer, president; S. F. Lawson, sales manager; Burton E. Lyman, office manager; John E. Collins, plant superintendent; Dan C. Johnson head of the shipping department.

Cylinder display of the Kansas Oxygen Co. at the Kansas State Fair

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METRO MANUFACTURING CO., Long Island City 1, N. Y.

Develop Age-Hardenable 18-8 Stainless Steel

OUTSTANDING among alloy-steel achievements of the war are the development of an age-hardenable stainless steel and of "super alloys" for high-temperature service in jet turbines, Dr. Marcus A. Grossman, director of research, and J. M. Hodge, development engineer, Carnegie-Illinois Steel Corp., revealed recently to the business press.

The new age-hardenable stainless is of the 18–8 group but characterized by additions of aluminum and titanium. This steel was said to be heat treated by quenching from an elevated temperature, followed by reheating in the range of 800–1,000 F to produce additional strength. It is said to possess the usual corrosion resistance of the ordinary 18–8 stainless. Another development in the 18-8 stainless field is a process for providing unusually low carbon contents, making it possible to use 18-8 in welding applications where ordinary 18-8 would cause the presence of a zone susceptible to intergranular corrosion.

Alloy steels of compositions including molybdenum, tungsten, cobalt, columbium, vanadium and titanium in entirely new proportions have been developed for high-temperature service in gas turbines and jet engines. The more severe the temperature requirements, the greater in general is the amount of alloy needed, declared Mr. Hodge. It is true, however, he added, that the use of small amounts of certain alloys in combination has often been found more effective than a mere increase in percentage of any one element.

* *

Cement Industry Told to Use More Welding

AT the recent convention of the Portland Cement Association held in Des Moines, Iowa, a paper was presented by W. J. Campbell and Aubrey Smith, General Electric engineers, to show the extensive savings that can be realized in cement plants by arc welding damaged or worn-out equipment. Expensive shutdowns can be prevented by this process and the life of some equipment can be lengthened by hard-facing before the damage occurs, declared Messrs. Campbell and Smith.

The paper recommended hard-facing for such equipment as crushers, grinders and agitators. The case was cited of a hard-faced crusher jaw which had lasted 500% longer than a new part.

* *

Rex Welder Opens New Assembly Plant

ADDING to its facilities for producing spot, resistance and projection welders, Rex Welder and Engineering Co. has opened a new assembly plant in the heart of its home town of Kansas City, Mo. Facilities include the latest methods for producing resistance-welding transformers and a testing laboratory for analyzing and testing customers' welding problems.

* *

Set up Symbols for Drawing Practices

WELDING symbols are among the four sections of the work of the Joint Army-Navy Committee on Standard Drawing Practices, now nearing completion. The other three sections nearly done are: abbreviations, drawing sizes, and screw threads. The standards on welding symbols are being coördinated with those of the American Welding Society so that there will be no technical differences between the two.

* *

Skilsaw Buys Forss Tools

As a supplement to its line of portable electric tools, Skilsaw, Inc., Chicago, recently purchased the Forss Pneumatic Tool Co., Aurora, Ill. Forss portable pneumatic tools will be sold to distributors along with the Skilsaw line.

New Distributor

All-State Welding Alloys Co., Inc., White Plains, N.Y., has appointed Welders Supply Co., 400 Pontius Street, Seattle, Washington, and Yakima, Wash., distributor for the complete line of "All-State" welding and brazing alloys and fluxes.

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For simple cable connectors that are unequalled in the welding connector field use ANDERSON EITHEREND. Eitherends are neither male nor female . . . no need to hunt for mating ends.
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FACTS WORTH NOTING

RUFLUX P

USED IN WELDING ROD FORMULATION

RUFLUX P is particularly desirable in welding rod formulation as an arc stabilizer. It contains no injurious impurities. Its chemical analysis shows approximately 73% TiO_2, 19% K_2O with the balance moisture, ignition loss, and oxides of zirconium, silicon, aluminum, iron, calcium, etc. It is milled to 1% on mesh screen.

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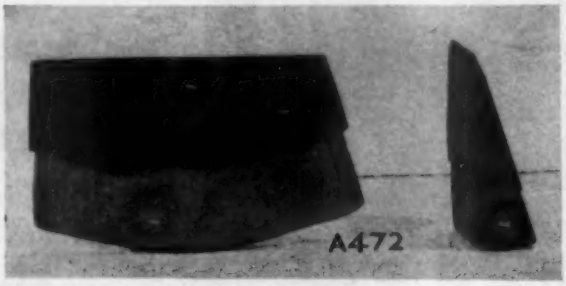
Durable Composite Cutting Tools Economically Made with *Toolface*..

Ready weldability, plus a high degree of hardness and toughness as deposited, makes Amsco *Toolface* a real saver of time and costs in making, altering and salvaging cutting tools and forging dies.

Toolface is a tool steel welding rod containing high carbon, high chromium, tungsten and vanadium—a composition commonly known as high speed steel. Its welded deposits have a Brinell hardness of 575 to 675, with sufficient toughness to resist fracture.

Toolface is used for producing composite cutting tools, such as those employed on lathes, shapers, milling heads, etc. Its ready weldability expedites the deposit of cutting edges or lands on mild steel bases or shanks, as shown in the drawing. This method, supplemented by the long-lasting hardness of *Toolface*, results in substantial economies in tool making. *Toolface* is responsive to heat treatment, including annealing, hardening and tempering. Its cutting surfaces can be readily dressed.

Picture A-472 shows *Toolface* deposited on inexpensive carbon steel and forged to shape. Note that the line of fusion has not been affected by the forging operation. Specimens were etched in diluted hot sulphuric acid. The resistance of *Toolface* to corrosion may also be noted.

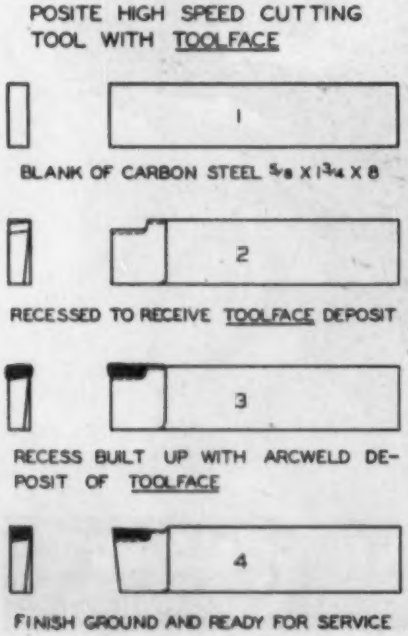


Other applications for *Toolface* include making composite forging dies and rock drill bits. It is also excellent for altering tools and for salvaging high speed tool parts that become broken or worn due to impact or abrasion.

Toolface can also be used as a general hard-surfacing rod where extreme hardness and resistance to shock are of primary importance.

Send for *Toolface* Bulletin.

(Amsco Welding Products are produced and sold in Canada by Canadian Ramapo Iron Works, Inc., Niagara Falls, Ontario.)


4 STEPS IN BUILDING A COMPOSITE HIGH SPEED CUTTING TOOL WITH TOOLFACE
1
BLANK OF CARBON STEEL ⅝ X 1¾ X 8
2
RECESSED TO RECEIVE TOOLFACE DEPOSIT
3
RECESS BUILT UP WITH ARCWELD DEPOSIT OF TOOLFACE
4
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Los Angeles, Calif.; St. Louis, Mo.
Offices in Principal Cities
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CHICAGO HEIGHTS • ILLINOIS
AMERICAN Brake Shoe COMPANY

Produce Plastic Rods from Nylon Powder

USING a nylon molding powder (Du Pont FM-1), the Polymer Corp., Reading, Pa., has developed a technique to extrude the plastic in rod form. The rods range from ⅛ to 2 in. in diameter and from 2 to 4 ft in length. The rods can be machined accurately, the company states, and their use seems feasible for bearings and other wear-resistant parts, particularly in applications where lubrication is difficult.

* *

New Firm Enters Oxygen Field

A NEW concern, Independent Oxygen Co., of Houston, Tex., has been incorporated for the manufacture of oxygen and acetylene. Gil V. Dye, owner of the Dye Welding Supply Co., Houston, Tex., is president of the new oxygen company. Guy Graham is vice-president, and P. W. McVey secretary and treasurer.

* *

Metal & Thermit Opens New Sales Office

A NEW sales office in the Land Title Building, Broad & Chestnut Streets, Philadelphia, has been opened by Metal & Thermit Corp. for handling the sale of Murex arc-welding electrodes. C. B. Cooper has been named office manager and will be assisted by J. G. Straub. Both men are from the home office sales staff.

* *

Welding on Program of Western Metal Show

THE best technical program ever presented to the metal industry at a Western Metal Congress is taking shape according to Dr. John E. Dorn, associate professor of metallurgy, University of California, Berkeley. Dr. Dorn is chairman of the program committee of the congress which will be held at Oakland Municipal Auditorium, March 22 to 27, 1947.

The Western Metal Exposition will be held simultaneously with the Western Metal Congress under the auspices of the American Society for Metals. The program will cover practically every phase of the manufacture, fabrication, inspection welding and use of metals.

Assisting Dr. Dorn in the work of the program committee are Prof. Cutler Shepard of Stanford University and Fred Donlevy of the Caterpillar Tractor Co., San Leandro, vice-chairmen of the committee, together with representatives of fifteen national technical and engineering societies.

Correction

ON page 92, THE WELDING ENGINEER, October, 1946, a news item was published concerning a German solder capable of withstanding gas-turbine temperatures. The statement is made that the solder is composed of 85% commercially pure silver and 15% magnesium. The correct composition is 15% manganese and not magnesium.

8 MAJOR DEVELOPMENTS .... *by* HARRIS

1 **FIRST** Gas Cutting in U. S. A. * in 1899 by John Harris.

2 **FIRST** exhibit of Torches, Acetylene Convention, St. Louis World's Fair in 1904.

3 **FIRST** Propane Cutting Torches in the World introduced in 1916.

4 **FIRST** "Gasavers" in U. S. A. This device has saved users thousands of dollars through gas economy.

5 **FIRST** "Automatic" Torch in the World. This Torch offers remarkable reductions in gas consumption.

6 **FIRST** Carbide-to-water Portable Automatic Low Pressure Acetylene Generator in U. S. A., making possible substantial savings in Acetylene Gas costs.

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* Early Foreign Patents on Cutting Torches and the Cutting Process afforded years of virtual monopoly. It was the prior use by Harris that was largely responsible for the invalidation of those patents in the U.S.A. thus greatly benefiting American industry.

The Harris Calorific Company offers a complete line of equipment for the Welding and Cutting Industry. Its Leadership in the field has gained for its products world-wide distribution and acceptance.

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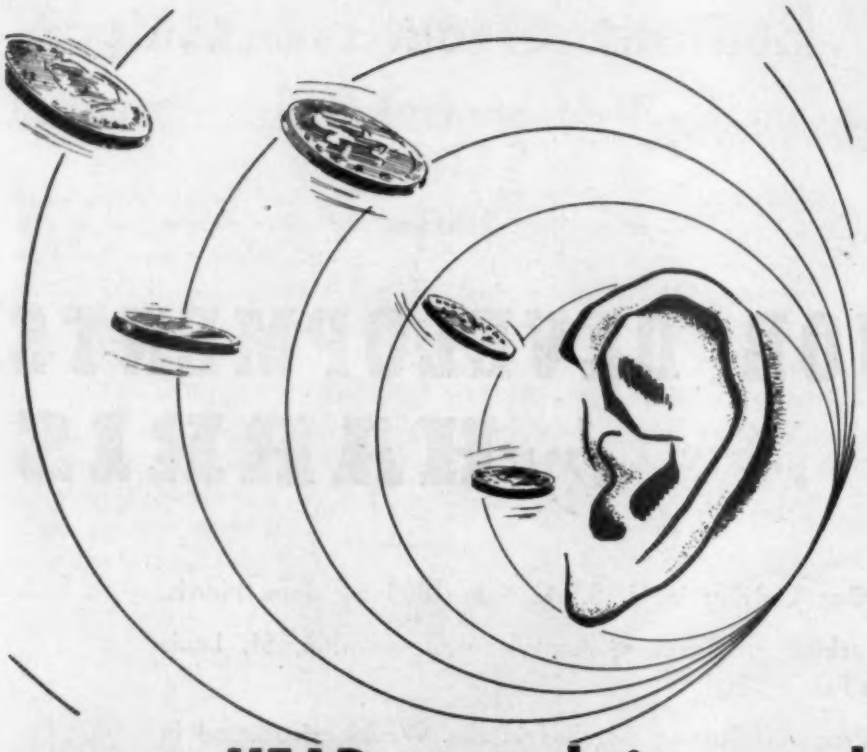

you can *HEAR* money being saved

Yes . . . you can *hear* economy when Speer Hold-Ark Electrodes are used on welding and cutting jobs. Their quiet-burning arc is a sure sign of high arc stability. That means better welding with less sputtering, less spindling. Because they have a more acute burning angle, Hold-Ark Electrodes last 33% longer.

Smooth-burning Hold-Ark carbon electrodes hold their wide-angle tip that concentrates the arc for hotter, more uniform welds. Down to the last usable inch they produce 13% more welds per inch, better bonds—real savings for you. That's why Hold-Ark Electrodes can be counted on for fast, easy welding at low cost.

So when you buy welding accessories, remember to ask for Speer Hold-Ark Electrodes—and don't forget Speer Carbon Welding Plates and Speer Welding Paste.

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About People

NED LANDIS has been named branch manager of the Syracuse, N.Y., office of Allis-Chalmers Mfg. Co. He succeeds LEONARD R. REID, who is now attached to the electrical department at the Milwaukee plant.

* *

C. R. DOBSON, formerly chief industrial engineer of the Jones & Laughlin Steel Corp., has been elected vice-president in charge of operation for the H. K. Porter Co., Inc. Mr. Dobson will supervise operations of the seven Porter manufacturing plants.

* *

GEORGE A. HAYS, formerly vice-president of Oil Well Supply Co., has been appointed vice-president and general manager of the Hinderliter Tool Co., a division of H. K. Porter. He succeeds FRANK J. HINDERLITER, retired.

* *

W. O. KUPPER has been appointed middle western sales manager of the fittings division, Ladish Drop Forge Co. Mr. Kupper will direct the sales of seamless welding fittings, forged steel fittings and forged steel flanges.

* *

FRANK P. SMITH has been appointed sales engineer in the Cleveland region for E. I. duPont deNemours and Co. His office will be located at 601 E. Robinson Street, Pittsburgh.

* *

EDWIN R. MOORE, JR., recently released from the Navy, has joined the public relations department of the Nash-Kelvinator Corp. Mr. Moore will make his headquarters at Kenosha, Wis. plant.

* *

FRANK MACMILLEN, formerly of the New York *Times*, has joined the staff of the American Standards Association as director of information. Mr. MacMillen will supervise an expanded educational program designed to inform the public and technical groups concerning the activities of the association.

* *

ROBERT C. SINGLETON has been appointed technical advisor to Nelson Sales Corp. at Lorain, O.

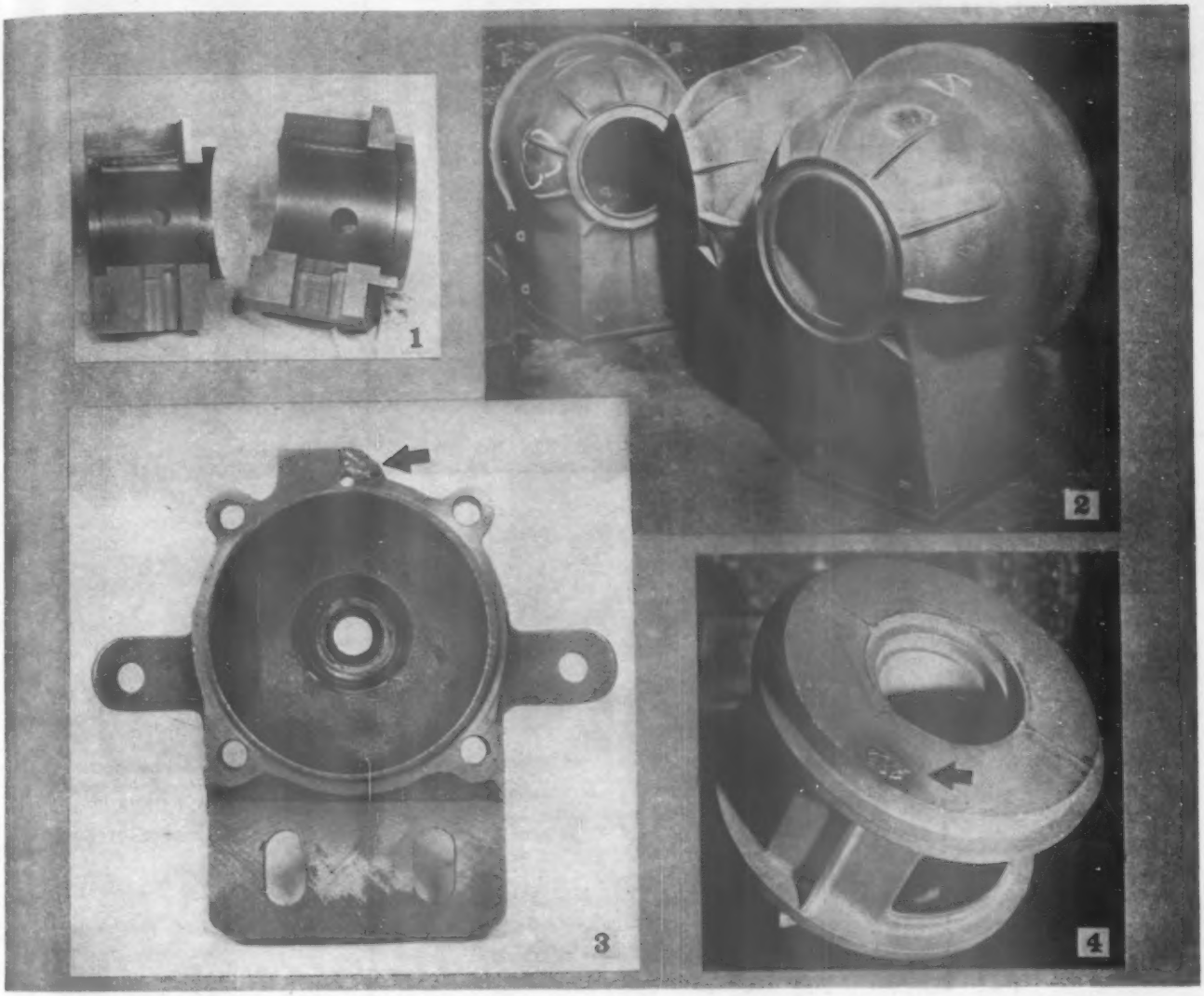
* *

LEIGHTON M. HARVEY, formerly with Wright Aeronautical Co., has been appointed sales engineer for the metal products division of Ryan Aeronautical Co., San Diego.

* *

HERMAN C. PHELPS, formerly instructor of welding and brazing for the public schools of Seattle, Wash., has been appointed west coast regional sales manager

PHILLIPS "600" Electrode in your rod-rack prepares you for savings like these



1. Incorrect machining had made these cast iron dies useless. A small machinable deposit of PHILLIPS "600" restored them to size in a few minutes and at a small fraction of replacement cost.

2. Defects which would otherwise cause the scrapping of these large castings were salvaged by gas tight deposit of PHILLIPS "600". Due to good color match, the weld is not visible after grinding.

3. An engineering change called for a small amount of additional metal on several hundred cast iron end plates after they had been fully machined. PHILLIPS "600" did this job. Note that a hole was drilled and tapped directly through the line of fusion.

4. A serious defect in this cast iron housing was repaired with PHILLIPS "600" in five minutes time. The deposit is fully machinable, including the line of fusion, and fully as strong as the parent metal.

These are just a few illustrations of the savings that are being made every day in hundreds of foundries, machine shops and welding shops, by using the metallic arc process with PHILLIPS "600" Electrode for the repair of defective or worn gray iron castings. The small amount of heating that is necessary avoids distortion; the deposit is sound, strong and fully machinable, including the line of fusion. Our new instruction sheet for making machinable welds in cast iron with PHILLIPS "600" Electrode gives step-by-step instructions in the proper procedure. There is no charge for it—write for your copy today.

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for the All-State Welding Alloys Co., White Plains, N.Y., manufacturer of a line of low-temperature welding and brazing alloys and fluxes.

* *

J. R. Barefoot, formerly plant engineer, has been named assistant to the executive vice-president and treasurer of the Federal Machine and Welder Co., Warren, O. Mr. Barefoot will be responsible for coördinating production of the various plants acquired by Federal in its postwar expansion, including the Warren City Mfg. Co. and the Sommer and Adams Co., Cleveland.

* *

Clyde B. Colwell, formerly in the sales department of the Carnegie-Illinois Steel Corp., has been appointed special representative for stainless steels of the Jessop Steel Co., Washington, Pa. He will specialize in the sale of solid stainless steels, stainless-clad steels, stainless-steel castings, heat-resisting and acid-resisting castings.

* *

Ward R. Schafer, formerly vice-president in charge of sales for Edison General Electric Co., Inc., Chicago, has been named general sales manager of Ideal Industries, Inc., Sycamore, Ill.

* *

W. C. Kegg, formerly with the Macbeth-Evans Glass Co., has been appointed personnel director of Progressive Welder Co., Detroit. Mr. Kegg will be responsible for employment and industrial relations as well as the supervision of company-sponsored employee activities.

* *

Eugene Somoff has been appointed to the newly created post of technical service engineer of the American Standards Association, New York City. He will collect and supply technical information concerning American standards and those of other countries.

* *

Clifford M. Manzer, formerly with the General Electric Co., at Lynn, Mass., has been appointed chief engineer of Progressive Welder Co., Detroit. He succeeds Walter L. Jewett, who has been named manager of development engineering.

* *

J. E. Fifield, formerly with the U.S. Naval Research laboratory, has joined the development and research division of the International Nickel Co. He will make his headquarters at the New England technical section, Hartford, Conn.

* *

Recent personnel changes in the American Manganese Steel division of American Brake Shoe Co. include the appointments of A. R. Sittig as manager of manganese steel sales, E. L. Quinn as assistant vice-president in charge of welding products and E. J. Nist as assistant vice-president. Mr Sittig and Quinn will have their offices in Chicago, while Mr. Nist will be located in New York City.

FOR THE FINEST IN WELDING . . . it's Miller A.C. Welders

● Yes, for really fine welding —faster, easier, safer and more economical—it's Miller A.C. Welders.

Built in a complete range of sizes from 20-180 to 200-1250 amperes. All Miller Regular and Industrial models have continuous control.

For full details stop at your jobber's store—try the Miller —or drop us a line and we will send you complete literature and the name of your nearest dealer.

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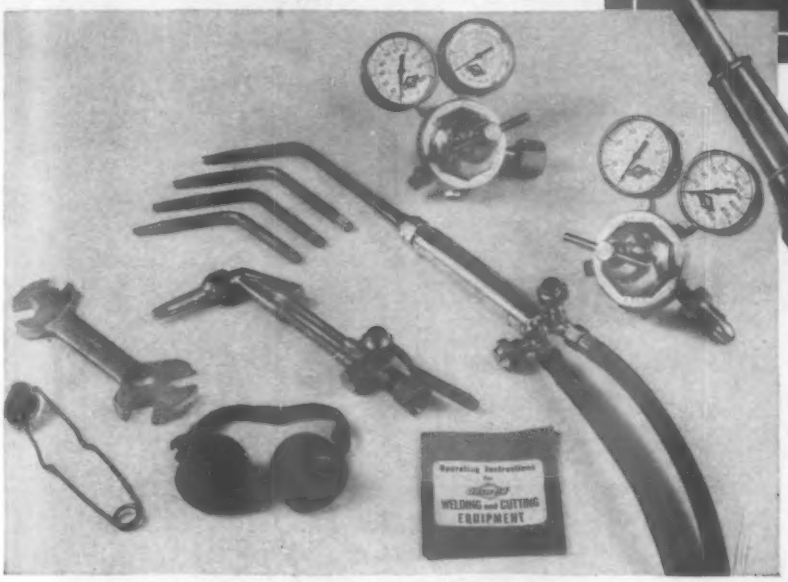
COMPLETE OUTFITS

for All Types of Welding and Cutting

Gasweld

Gasweld Equipment conforms fully with standards of the Underwriters' Laboratories



WG-25 Welding Outfit with Cutting Attachment

WG-25 Welding Torch

"Gasweld" Welding and Cutting Torches

● All types of "Gasweld" Torches are now available as part of general welding and cutting outfits — complete with oxygen and acetylene regulators, goggles, hose and safety spark lighter.

Whatever the job — there's a "Gasweld" Torch for the purpose — with less "handling fatigue" and greater economy in gas consumption. Large or small, Gasweld equipment is versatile... It's easier to handle and steps up output noticeably.

On light work, or heavy — in tight corners — for all kinds of production welding and cutting — Gasweld units have the speed, feel, and handiness that experienced operators look for and prefer.

For full data on welding and cutting torches and complete outfits write for our Gasweld Catalog.

AV-10—Special lightweight AIRCRAFT torch for welding aluminum and light gauge metals

Gasweld Machine Cutting Torches are available for use with any flame-cutting machine.

Gasweld Pressure Regulators assure ample gas supply at an even, constant pressure.

Wall Chemicals Division of
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Branches and Dealers in Principal Cities

WILLIAM K. GREENE has been appointed assistant division engineer of the Chicago district of American Bridge Co. He succeeds T. A. JORDAN, who retires after 36 years of service with the company.

* *

R. W. SHARP has been appointed manager and sales engineer of the Lincoln Electric Company's new office at 3343 Central Ave., Indianapolis.

* *

JAMES W. KETTLE has been appointed works auditor of Carnegie-Illinois Steel Corporation's Gary Sheet and Tin mill. He succeeds CHARLES D. HENDERSON, who retires after 40 years of service with U.S. Steel Subsidiaries.

* *

THOMAS T. DICKSON has been appointed manager of the specialty and machinery division, general sales department of U.S. Steel Supply Co. Mr. Dickson will make his headquarters in Chicago.

* *

Died . . .

HENRY M. HOBART, pioneer in the electrical industry and a consulting engineer with General Electric Co. for 30 years, died Oct. 11 after an illness of three weeks. Mr. Hobart was responsible for several changes made in the design of induction motors about 1911, and in 1936 he received the Samuel Wylie Miller Medal of the American Welding Society for his achievement in the welding field. He had retired in 1941.

* *

THOMAS MORRISON, a director of the International Nickel Co. of Canada, Ltd., died Oct. 26, at his home in Spring Lake, N.J.

IN THE JANUARY ISSUE—

ANNUAL REVIEW OF THE WELDING INDUSTRY

and, All the usual features and departments.

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THE STANDARD OF QUALITY

Throughout the World

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WELDING RODS

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THE CHICAGO HARDWARE FOUNDRY CO.

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A tested carbide . . meeting International and Federal specifications . . generating acetylene in 12 countries. Standard sizes in 100-lb. and 500-lb. drums. Location of our plant at Portland, Oregon permits low-cost delivery to all deep-water ports. Address:

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351 California Street
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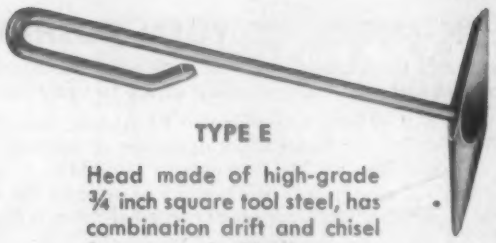
TYPE A

Drift and Chisel. Made from high-grade tool steel. Popular in malleable iron and grey iron foundries for general chipping.

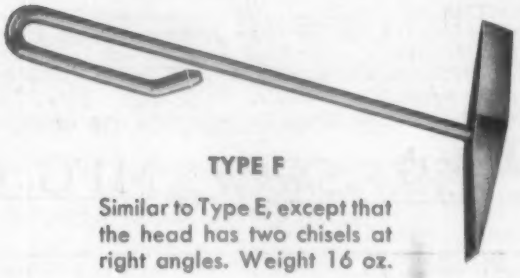


TYPE E

Head made of high-grade ¾ inch square tool steel, has combination drift and chisel for general chipping purposes. Special hand grip absorbs shock. Weight 16 oz.

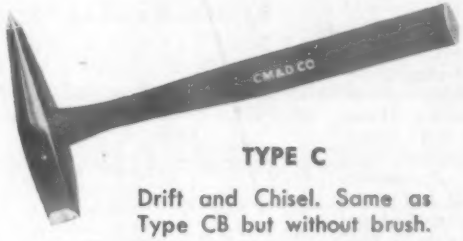
TYPE CB

Triple Duty. Combines 3 tools in 1—drift, chisel, and removable wire brush.



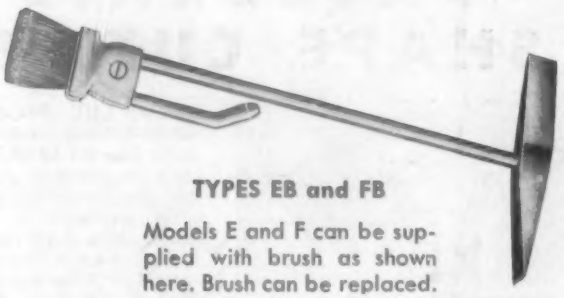
TYPE F

Similar to Type E, except that the head has two chisels at right angles. Weight 16 oz.



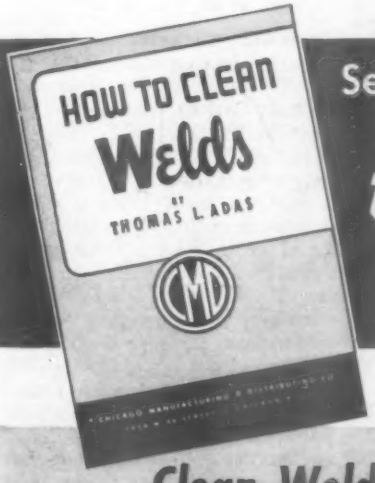
TYPE C

Drift and Chisel. Same as Type CB but without brush.



TYPES EB and FB

Models E and F can be supplied with brush as shown here. Brush can be replaced.



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CHEK-SHOCK OXYGEN CUSHION VALVE

SOFTLY controls the vicious "jolt" of high pressure oxygen gas, thus eliminating regulator repairs and preventing possible injury to operators.

- Will allow tank valve to be opened rapidly without damage to regulator or danger to operator.
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- Will eliminate possible injury to operator from burstings.
- Will prevent unnecessary internal wear in regulator (*as NOT necessary to release control screw before opening tank valve*).

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#1. STANDARD COUPLER . . . for all standard size welding type oxygen regulators.
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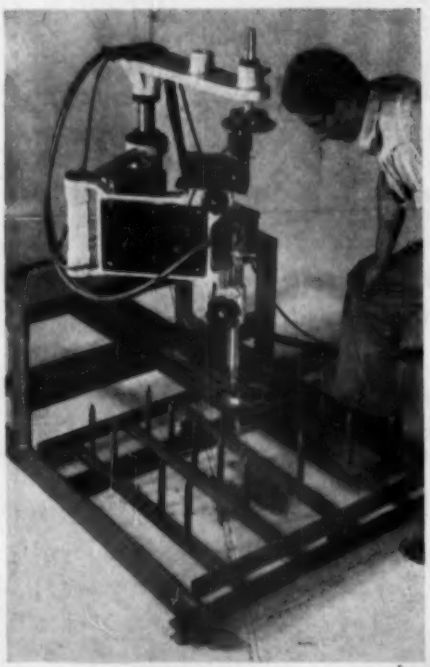

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SPECIFICATIONS

OVERALL DIMENSIONS	36"×60"×58" High
MAX. THICKNESS OF CUT WITH STD. BLOWPIPE	8"
CIRCLE CUTTING RANGE	0"—30"
STRAIGHT LINE CUTTING	65"
CUTTING SPEED, INCHES PER MINUTE	3"—30"
ELECTRICAL REQUIREMENTS	115V—AC or DC
NET WEIGHT WITH SEMI-STATIONARY BASE	534#
NET WEIGHT WITH PORTABLE BASE	347#

Send for latest bulletin with complete specifications and operating views.

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Ohmstede Machine Works
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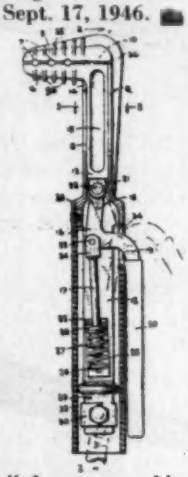
O.M.W.

From the Patent Office

Electrode Holder

2,407,836. FREDERICK GEORGE KETELBY and GEORGE MASON, Birmingham, England. Filed Jan. 16, 1945. Issued Sept. 17, 1946.

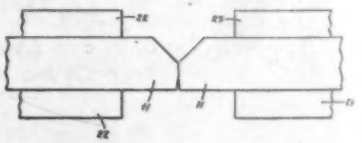


An electrode holder including a pair of jaws and a shank for each jaw. One of the shanks is a channel in which the other shank is slidably mounted to move the jaws. Toggle links are connected between one end of the slidably mounted shank and an abutement in the channel-like shank. An operating handle moves the toggle mechanism against a spring. The toggle links are movable through an over-dead-center position, so that the grip on the electrode is maintained automatically without the necessity of the operator maintaining pressure on the handle.

* *

Fusion Welding Method

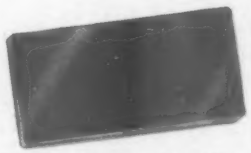
2,405,542. FRANK A. WASSELL, Schenectady, N. Y., assigned to GENERAL ELECTRIC CO., Schenectady. Filed Sept. 13, 1943. Issued Aug. 6, 1946.



A method of fusion welding metal parts having joining edges about ⅛ inch thick which when molten assume large globular formations that do not readily intermingle to form a weld. The joining edges of the parts are positioned relative to one another so that the top edge portions make a good contact with one another along their lengths while spaced from one another by bottom edges are separated by an outwardly opening gap. The gap is sufficient to permit the joining edges to drop down and away from one another without coming into contact with one another when rendered molten during welding. Heat is progressively applied lengthwise of the top edge portions of the joining edges. As the joining edges become molten and drop down and away from one another, then supply molten filler material in sufficient quantity to fill the gap formed and thereby complete a weld between the parts.

WELDING PRODUCTION UP .... WITH BAUSCH & LOMB QUALITY WELDING GLASS

WELDING COSTS DOWN



Bausch & Lomb Welding Glass is available in a range of 12 densities, conforming to government specifications.

Real protection, but lightweight — cool and comfortable, too — Bausch & Lomb Welding Goggles with lenses of genuine B&L Welding Glass.

● A safe margin of eye protection—against infra-red, ultra-violet, and glare—is offered by Bausch & Lomb Welding Glass. In addition, it's of real *optical quality,* uniform, distortion-free, to give clear vision without eyestrain. B&L Welding Glass—in helmets, hand shields, and goggles—makes vision comfortable and efficient, makes for greater and higher quality production, lowered costs. Bausch & Lomb Optical Co., 754-12 St. Paul Street, Rochester 2, N. Y.

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The Ortho-Rater technique of the Bausch & Lomb Industrial Vision Service identifies accident-prone workers. In one department, 80% of accidents happened to people who fell below Ortho-Rater Visual Performance Standards. The B&L Industrial Vision Service is being used successfully to reduce accidents, by placing workers on hazardous jobs according to scientific visual fact-finding. It contributes also to increased production, improved quality, reduced labor turnover and lower training costs.

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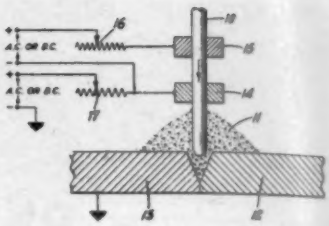

Submerged-Melt Welding

2,405,673. Egon B. Scherl, New York City, assigned to The Linde Air Products Co., New York City. Filed Jan. 20, 1944. Issued Aug. 13, 1946.

This patent provides an improvement for a welding process in which metal from an electrode is melted and deposited onto a metal workpiece and simultaneously metal of the workpiece is melted and coalesces with the deposited metal. The improvement consists in the step of applying only to the electrode heat (in addition to the heat derived from the electric melting current sent through the electrode to the workpiece) in an amount sufficient to increase the ratio of melted electrode metal to melted workpiece metal.

* *

Induction Heater

2,407,562. Einar G. Lofgren, Minneapolis. Filed Aug. 17, 1942. Issued Sept. 10, 1946.

In this induction heater is an inner drumlike shell having an inlet passage in one end and an outlet passage in its other end. A paramagnetic heating core is enclosed entirely within the shell, in peripheral contact with the inner surface of the shell and spaced to provide fluid chambers between the heating core and the ends of the shell. The heating core consists of telescopically engaged inner and outer heating elements formed to provide an annular coil space between them. An induction coil is incorporated in the core between the inner and outer heating elements. The inner heating element of the core is provided with a cooling fluid passage connecting the opposite end chambers of the shell, and the outer heating element is provided with circumferentially spaced passages connecting the end chambers of the shell. There is also an outer drumlike shell having a fluid passage at one end to the space between the two shells and a fluid conduit leading to the adjacent end chamber of the inner shell.

* *

Signallium Electrode Holder

2,406,365. Achilles C. Gough, Pocatello, Idaho. Filed Aug. 27, 1943. Issued Aug. 27, 1946.

An electrode holder with an audible signalling device. An electromagnetic means is actuated by the welding current to cause pivotal movement of an arm extending axially beyond the housing. This causes the welding arc to be struck. A means responsive to variations in the energization of the electromagnetic means actuates the signalling device.

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"Wheel cost cut 60%," says one superintendent.

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1. The unique Norton electric furnace process which eliminates crushing, produces grains with many sharp points for faster, easier, cooler cutting.
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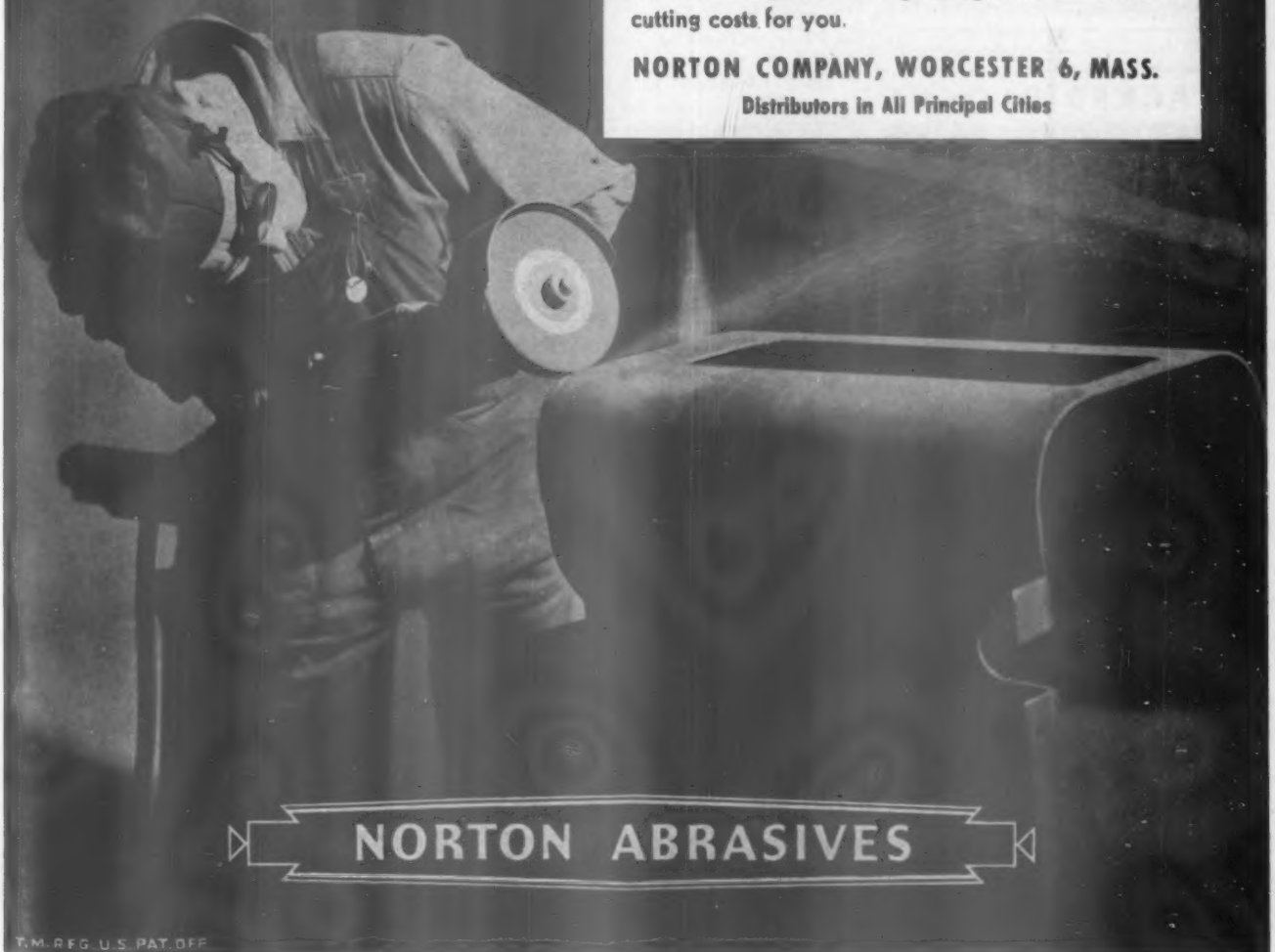

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SPOT WELDERS
for more work at lower cost
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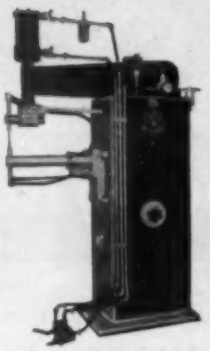

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All type welders in stock and made to order.

Alphil Welders are of proved dependability. Their versatility makes them adaptable to a wide range and variety of work. They are widely used for sheet metal and wire fabrication, and are especially advantageous where jobs involve "hard-to-get-in places".

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MOGULOID COMPANY OF AMERICA
Division of Metallizing Company of America
Dept. WE, 1330 W. Congress Street, Chicago 7, Illinois

Weldor's Mask

2,400,993. EDWARD S. HEBLER, Williamsville, N. Y., assigned one-half to UNIT RAYS, INC., Cleveland. Filed Oct. 4, 1943. Issued May 28, 1946.

A weldor's mask or helmet having a vision opening. A glareproof shield is movable upwardly into and downwardly out of registration with the opening. A spring connected with the shield tends to move it upwardly into registration with the opening. A locking member below the shield moves with it, and a pivotally supported arm is located rearwardly of the shield. The latter arm has a cooperating locking member positioned to engage the other locking member when the shield is in its lowered position. A spring urges the arm forward in order to bring the locking members into engagement with each other. A chin-actuable means rocks the arm against the action of the spring.

* *

Arc-Welding Control

2,400,992. EDWARD S. HEBELER, Williamsville, N. Y., assigned one-half to UNIT RAYS, INC., Cleveland. Filed Dec. 26, 1942. Issued May 28, 1946.

A remote control for a metal-arc welding apparatus. It includes a variable resistance in the welding current circuit and a movable switch element cooperating with the resistance. Opposed reciprocable members are each connected with the switch element to move it in opposite directions. A course of pressure fluid supply leads to each of the members and valves control the supply of pressure fluid. A means including an electrical circuit is supplied for operating each of the valves, and an electric switch controls each of the last-mentioned circuits.

* *

Hard-Facing Alloys

2,402,424. ROY B. MCCAULEY, Chicago Heights, Ill. Filed Jan. 20, 1945. Issued June 18, 1946.

A hard, tough, corrosion-and-abrasion-resistant ferrous phosphide alloy requiring no heat treatment to develop its desirable properties. It contains chromium in an amount of 10 to 30%, phosphorus from 0.75% up to its upper limit of 5% and substantially identical quantities of copper and nickel from 0.50% to their upper limits of 5%. The remainder is iron with other ingredients such as carbon, silicon and other elements being present as impurities in quantities less than 1%.

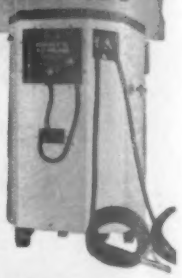
* *

Welding Rod

2,405,666. STANLEY M. NORWOOD, Great Neck, N. Y., assigned to ELECTRO METALLURGICAL CO., W. Va., Filed May 6, 1944. Issued Aug. 13, 1946.

A welding rod composed of substantially austenitic iron-chromium-nickel alloy containing 10% to 30% chromium; 4% to 30% nickel; 0.5% to 7% manganese; 0.05% to 0.25% vanadium; 0.01% to 0.5% carbon; the remainder, except for fluxing materials, iron and incidental impurities.

AN AC ARC WELDER TO FIT YOUR NEEDS



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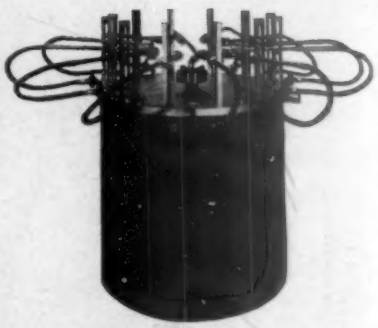

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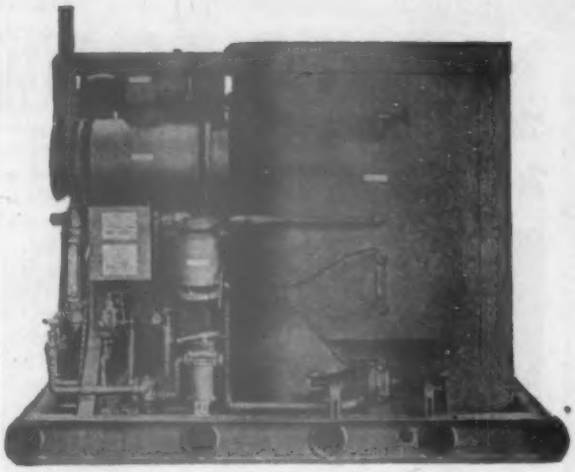

WHEN it's a case of welding copper or the copper alloys, it has proved, time and again, to be a job for the carbon arc and Chase Welding Rods.

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The carbon arc method saves man-hours and materials, cuts construction costs. Chase engineers have made the method adaptable to copper-to-copper construction—extending the advantages already proved in the welding of the copper alloys.

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HERE YOU SEE the evaporator of distillation unit carbon arc welded together with close-up of the weld. Evaporator is formed of Chase Olympic Bronze sheet; Chase Olympic Bronze Welding Rods are used in construction. Total weight of brass, bronze and copper required for complete unit—7000 lbs.

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Flame-Resistant Fabric

2,406,779. JOHN L. KURLYCHEK, Orange, N.J., assigned to UNITED STATES RUBBER CO., New York. Filed Dec. 30, 1942. Issued Sept. 3, 1946.

This patent pertains to a method of treating a fabric that is formed predominately of asbestos fibers but contains some inflammable fibers without changing appreciably its appearance, softness, or weight. The treatment consists in precipitating on the fibers a flame-resistant water-insoluble inorganic oxide and then depositing over the oxide a water-repellent zinc soap of cocoanut oil acids. The fabric is heated sufficiently to melt or fuse the deposited soap so as to fix it and the oxide upon the fibers and render the fabric non-flame-supporting and water-repellent. The treated fabric is pervious to the air and the soap upon it and will not generate obnoxious fumes when exposed to relatively high temperatures.

* *

Electrode Holder

2,405,406. GEORGE A. COMBRIDGE, Los Angeles. Filed Mar. 15, 1944. Issued Aug. 6, 1946.

An electrode holder comprising a handle and a tubular core for receiving and gripping welding rods. A hand pressure plate is hinged to the handle and a toggle lever is pivoted to the pressure plate and has ball-and-socket engagement with a block seated in the rear of the tubular core.

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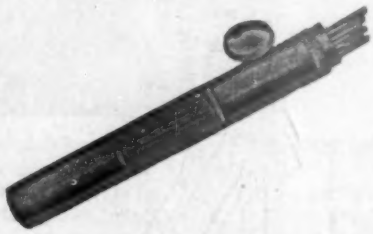

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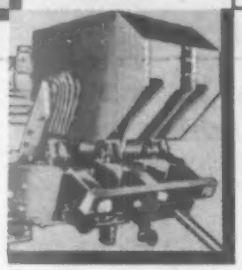

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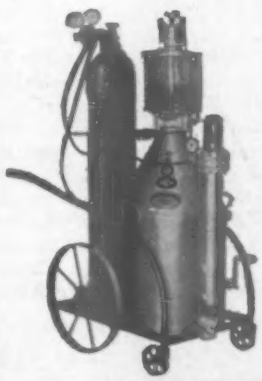

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Suitable for light or heavy duty—available with solid or channel toggle bar adaptable for variety of fixed or adjustable pressure spindles.

FOR HEAVY WORK—*use Toggle-Action C-Clamps*
The quick-fastening and quick-releasing feature of these C-Clamps is particularly advantageous when you work with heavy parts.

TO CLAMP VARYING THICKNESSES—OR WHERE CHANGE OF ANGLE IS REQUIRED—*use KK or KS Series*
The cam action of toggle bar of the KK style compensates for variations in thickness. The swivel plate of the KS style permits change in clamping position to be simply made.

WHERE WORKING CLEARANCE OVER CLAMPED WORK IS LIMITED—*use KP Series*
Both toggle bar and handle are horizontal, allowing free movement of operating tools above work, as in drilling, tapping, etc.

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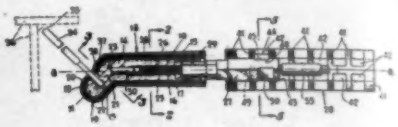
KNU-VISE INCORPORATED

Electrode Holder

2,405,536. MARTIN WELLS, Los Angeles. Filed May 20, 1943. Issued Aug. 6, 1946.



In an electrode holder, the combination of: a metal body having a rod opening leading in from the face thereof, and a second opening leading into the body to meet the rod opening; operable means acting within the second opening to apply pressure to the end of a rod inserted in the rod opening and thereby grip the rod; replaceable insulator means comprising a cup of insulating material slidable onto the metal body from the front end, the cup having an opening defined by a wall surrounding the mouth of the rod opening to guard the latter from entry of welding splatter; yieldable holding means within the cup providing an engagement to hold the cup on the body; a handle connected to the body; means for connecting an electric conductor to the body.

* *

Oscillating Welding Electrode

2,407,746. JESSE E. JOHNSON, Colbert, Wash. Filed Dec. 2, 1944. Issued Sept. 17, 1946.

A fusible welding rod having a multiplicity of reverse bends including end loops and intermediate portions. The latter connecting the bends and extending in a direction at an angle to the axis of the rod. The intermediate portions are alternately disposed to form notches on the opposite sides of the rod. The notches are of a substantially greater depth than the distance between their opposite faces, and the reverse bends have a thickness substantially greater than their maximum width.

* *

Automatic-Welding Feed

2,402,937. LEONIDAS K. STRINGHAM, University Height, Ohio, assigned to THE LINCOLN ELECTRIC CO., Cleveland. Filed July 13, 1944. Issued June 25, 1946.

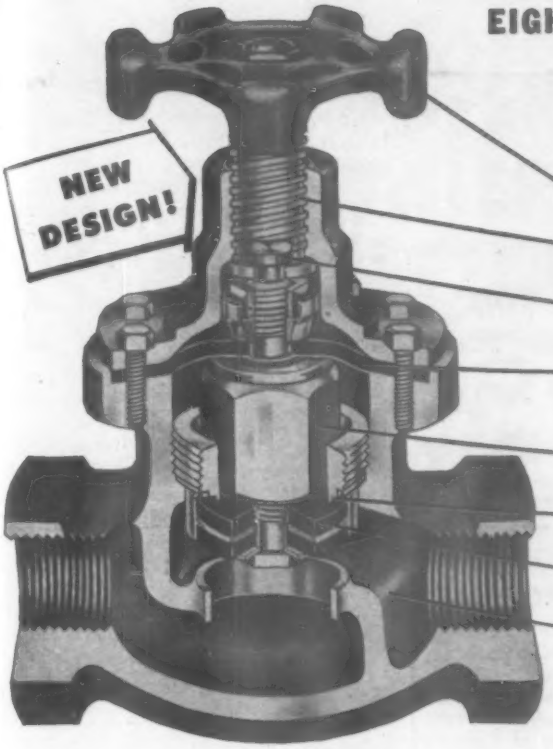
In apparatus for automatic arc welding, the combination of a support, a flexible tube depending from it in free hanging relation, means to feed an electrode downwardly through the tube, contacts for supplying current to the electrode, and means to supply granular fluxing material in freely falling condition through the tube.

* *

Face Shield

2,406,598. OSCAR S. FLOOD, Chicago. Filed Oct. 9, 1943. Issued Aug. 27, 1946.

A face shield comprising a headband, a shield member having a plurality of openings in the upper edge thereof, means for fastening the shield member to a support secured to the head band.



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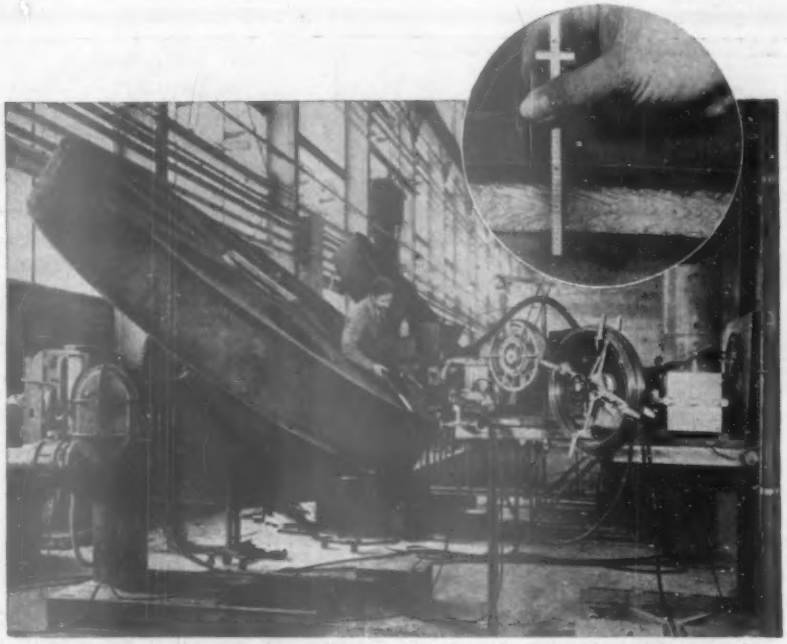

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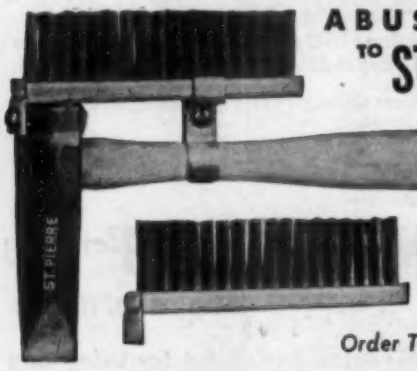

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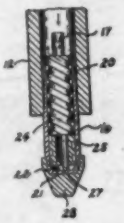
ST. LOUIS 7, MISSOURI

Spot-Welding Electrode

2,409,550 MATTHEW DOBKOWSKI, Detroit, Mich. Filed December 4, 1944. Issued October 15, 1946.



A spot-welding electrode comprising a thin cylindrical shell, closed at one end by a transverse wall. An elongated member is axially disposed within said shell and has an axial passage inside and a spiral groove on its outer surface. The inner end of this member terminates short of the transverse wall to leave a free space adjoining the wall. The axial passage in the member conveys cooling liquid to the free space, while the groove affords an outlet for the liquid from the shell.

* *

Weldor's Face Shield

2,406,092. ROGER E. MEYER, St. Paul. Filed Feb. 13, 1943. Issued Aug. 20, 1946.

A combined welding hood and eye shield comprising a harness designed to fit the head of a weldor, opposed clips on the harness, an eye shield including arms projecting into engagement with the clips, a welding hood extending over the clips, pivot means supported by the clips extending through the arms, clips, and welding hood. The clips embrace the pivot between the arms and hood to pivotally attach the eye shield and hood to the clips. A resilient means on the pivot urges the arms and the hood against the clips for resisting pivotal movement between the pivotally attached elements.

* *

Torch Tip

2,408,588 SIDNEY SPRAGUE WATTS, Southgate, London, England, assigned to THE BRITISH OXYGEN CO., LTD., London. Filed August 6, 1941, in Great Britain, Sept. 20, 1940. Issued October 1, 1946.

A torch tip member having a cylindrical axial passage for an oxidizing gas, and a relatively short delivery passage of lesser diameter for forming gas into a jet. There is also a tapering transition passage between the axial and delivery passages and antiswirl means in the axial passage for delivering a gas stream having reduced swirl characteristic.

* *

Tungsten-Coated Electrode

2,408,619 ERWIN FELIX FRIEDLANDER, Hobart, Tasmania, Australia, assigned to O. & F. COMPANY PROPRIETARY LTD., Hobart, Tasmania, Australia. Filed November 10, 1943, in Australia, Nov. 14, 1942. Issued October 1, 1946.

An arc-welding electrode consisting of a mild-steel core wire and a coating of the following ingredients in percentages by weight as indicated: tungsten 35%, molybdenum 13.5%, ferro-chromium 13%, ferro-vanadium 6.5%, graphite 5%, calcium carbonate 5%, sodium silicate in substantially 20% and cellulose.

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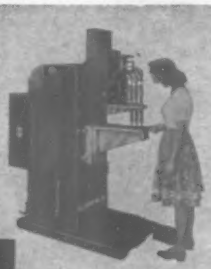

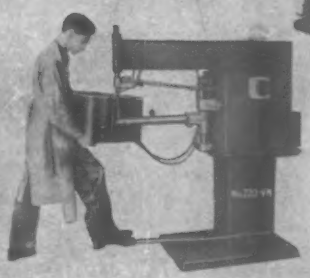

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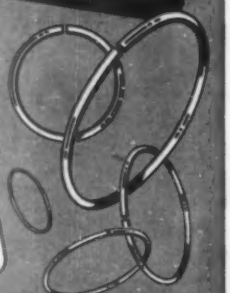

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- HEATING JOBS

for use with—
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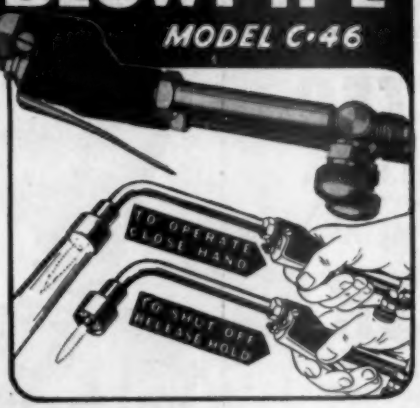

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Operator's natural hold produces full working flame—releasing hold reduces flame to a very small pilot light, thus saving gas and air otherwise wasted when tool is not in actual operation. When worker again grasps the handle to resume operations, the blowpipe instantly converts to full flame at original adjustment. In addition to saving gas and air, it eliminates all danger of the full flame, with the possible accident hazards.

A sturdily built, properly balanced tool, with easy accessibility to valves and seat adjustment. Regularly used by most of the large industrial plants having a need for this type of tools.

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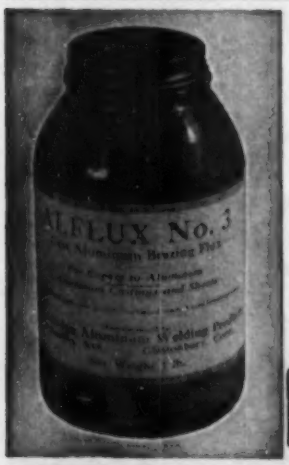

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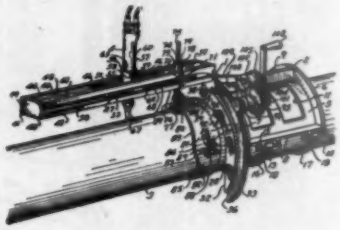
Pipe-Cutting Apparatus

2,408,517 POSY A. HOWARD, Tulsa Okla., assigned one-half to C. A. MATHEY and one-half to C. B. HARTER, Tulsa. Filed Sept. 4, 1943. Issued Oct. 1, 1946.



A pipe-cutting apparatus with segmental ring and track members having ends spaced apart to pass the members over a pipe to be cut. The saddle supporting the track member has a means for engagement with the pipe for positioning the axis of the track member concentric with the axis of the pipe. Clamping means secures the saddle to the pipe. A pair of driving members supported in fixed relation to the saddle have driving contact with the segmental ring for moving the ring member on the track member. On the ring member is a means for mounting an instrument for movement longitudinally of the pipe. A template is adapted to fit against one side of said segmental track and provided with a guiding edge. A flange on the template follower engages with the template for limiting movement of the follower toward the pipe; follower is resiliently urged to engage with the template for controlling the cut of the pipe in accordance with the shape of the template.

* *

Chain Welding Apparatus

2,405,510. DANIEL C. MAYTAG, Laurel, Iowa. Filed Apr. 3, 1943. Issued Aug. 6, 1946.

In resistance welding apparatus for welding successive links of a chain, a pair of gripping members each provided with a recessed jaw at one end for gripping and retaining each link of the chain in position for welding and applying a predetermined and controlled pressure. An adjustable connection is provided between the forward ends of the gripping members for adjusting the latter to accommodate links of varying dimensions.

* *

Stud Welder

2,405,177. JOHN COLLIER BECKETT, United States Navy. Filed July 22, 1943. Issued Aug. 6, 1946.

A welding device including a casing, a foot fixedly attached to the casing for supporting a flat-headed pin, the point of which is to be welded to an object. The supporting means is movable in the casing and provides a shallow head-receiving recess at the outer end to receive the flat head of the pin. The sole surface of the foot is substantially in the plane of the head-receiving recess when the supporting means is at the end of its travel in the casing.

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Avoid eye strain. For guarding your eyes against strain while doing prolonged and intensive eyetasks, as in welding, use Ever-Klear Cover Lens.

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Size 2x4½" for arc-welding shields.....$2.40 per dozen
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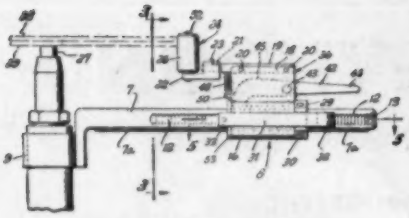
FOR THE LATEST WELDING NEWS
THE WELDING ENGINEER



Spot-Weld Edge Gauge

2,408,847 BERNARD GROSS and LEO W. CORNWALL, San Diego, Calif., assigned to ROHR AIRCRAFT CORP., Chula Vista, Calif. Filed November 21, 1945. Issued October 8, 1946.

A spot-weld edge gauge, comprising a rod secured at one end adjacent to one of the electrodes of a spot welder, an edging roller assembly and carriage mounted upon the rod to slide toward and from the electrode. The roller assembly may be detachably clamped to the rod, in the adjusted position.

* *

Plastic Eyecups for Goggles

2,407,518. GEORGE H. SCHAUWEKER, Southbridge, Mass., assigned to AMERICAN OPTICAL CO., Southbridge, Mass. Filed Dec. 18, 1943. Issued Sept. 10, 1946.

A pair of eyecups formed of heat-expandable plastic. Each eyecup has an integral edge portion shaped to fit the face of the wearer and an opposed portion formed with an inner lens-receiving groove. Grooves of a greater depth than the depth of the lens-receiving groove are radially disposed transversely of the latter. The contour edge of the lens is in intimate engagement with the groove between the transversely extending grooves. The integral side wall on the temporal side of each eyecup is of a thickness much less than the thickness of the remaining side walls of the eyecup and has a plurality of spaced openings extending through it.

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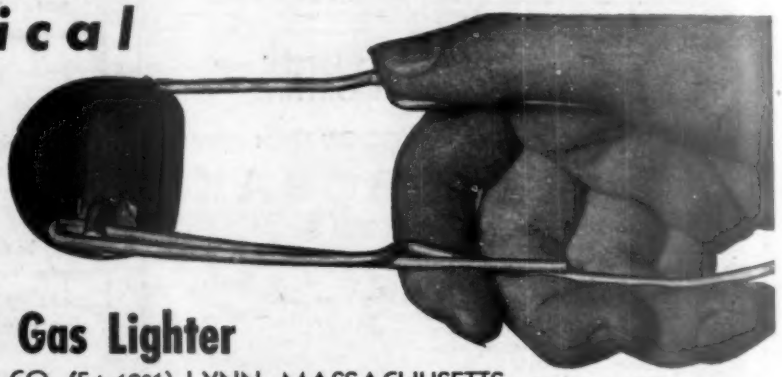
Unrivalled economy is provided by the many superior, exclusive design and construction features of the Improved "Round File" lighter. A large file area is provided—approximately one square inch. The file is of superior quality, hardened in our own factory. The spark metal is of large diameter and the patented cartridge holding the metal locks exactly into position, permitting instant replacement. Every part of the lighter is thoroughly tested.



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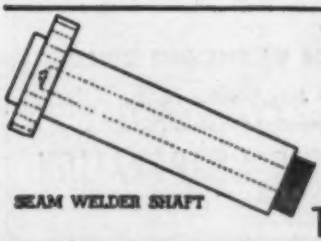

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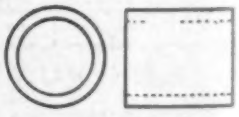

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The advertising rate is $6.75 per inch for all advertising appearing on other than a contract basis. Contract rates quoted on request. AN ADVERTISING INCH is measured ⅓ inch vertically on one column, 3 columns—30 inches—to a page. W. E.

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Ransome Universal Welding Positioners, motor driven, in the following sizes; 2500 lbs., 3000 lbs., 6000 lbs., and 16,000 lbs. capacity. Equipped with necessary motors and belts, in excellent condition and ready to run. We have the best selection of these positioners available, but they are moving rapidly, and we will not be able to replenish our stock, so place your order now by wire or telephone.

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These welding rods were manufactured by Air Reduction Sales Company and are in perfect condition. They are offered at $3.00 per 100 lbs. f. o. b. cars, Columbia, S. C., on an all or none basis.
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LEGAL NOTICE

STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACTS OF CONGRESS OF AUGUST 24, 1912, AND MARCH 3, 1933

Of The Welding Engineer, published Monthly at York, Pennsylvania, for October 1, 1946.

State of New York }
County of New York }

, Before me, a Notary Public in and for the State and county aforesaid, personally appeared J. A. Gerardi, who, having been duly sworn according to law, deposes and says that he is the Secretary of the McGraw-Hill Publishing Company, Inc., publishers of The Welding Engineer, and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily paper, the circulation), etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, as amended by the Act of March 3, 1933, embodied in section 537, Postal Laws and Regulations, printed on the reverse of this form, to wit:

1. That the name and address of the publisher, editor, managing editor, and business manager is: McGraw-Hill Publishing Company, Inc.; Editor, T. B. Jefferson; Managing Editor, C. B. Clason; Business Manager, A. M. Morris, all of 330 West 42nd St., New York 18, N. Y.

2. That the owner is: McGraw-Hill Publishing Company, Inc., 330 West 42nd Street, New York City. Stockholders holding 1 % or more of stock: James H. McGraw; James H. McGraw, Jr.; James H. McGraw, Jr., Curtis W. McGraw and Edwin S. Wilsey, Trustees for: Harold W. McGraw; James H. McGraw, Jr.; Donald C. McGraw; Curtis W. McGraw, all of 330 West 42nd Street, New York City; Edwin S. Wilsey and Curtis W. McGraw, Trustees for James H. McGraw, 3rd, Madison, New Jersey. Curtis W. McGraw, 330 West 42nd Street, New York City; Donald C. McGraw, 330 West 42nd Street, New York City; Mildred W. McGraw, Madison, New Jersey; Grace W. Mehren, 536 Arenas St., La Jolla, Calif.

3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are: None.

4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him.

J. A. GERARDI, Secretary.
McGRAW-HILL PUBLISHING COMPANY, INC.

Sworn to and subscribed before me this 24th day of September, 1946.
(SEAL) ELVA G. MASLIN.
(My commission expires March 30, 1948.)

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4—Lincoln Welders, 150 Amps, 220/3/60 (25 Amps)
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One 100 KVA Spot Welder with contactor and timer practically new excellent condition.
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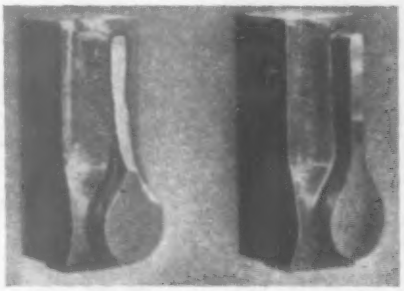
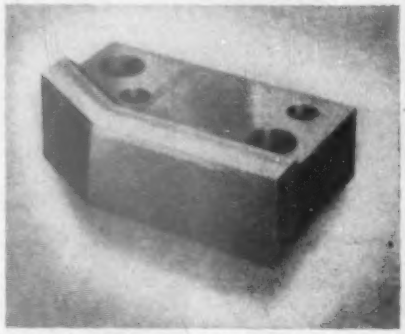
SAVE 3 WAYS

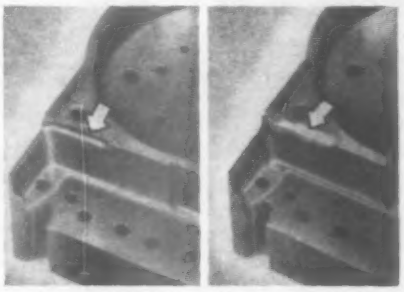
With *Eureka* Tool & Die Welding Electrodes



1 (Left) Save man hours, conserve material and minimize production delays by welding with EUREKA Tool and Die Electrodes. Die unit shown failed in operation but was quickly repaired by welding. No heat-treatment required.



2 (Right) For creating cutting edges or working areas in composite fabrication, EUREKA Electrodes are used with mild, medium, high carbon or S.A.E. steels as a base. No heat-treatment required.



3 (Left) EUREKA Tool & Die Welding Electrodes are used for correcting design by facilitating changes in contours, corners or edges during try-out or change-over periods, or for rectifying manufacturing errors, thus eliminating inserts.

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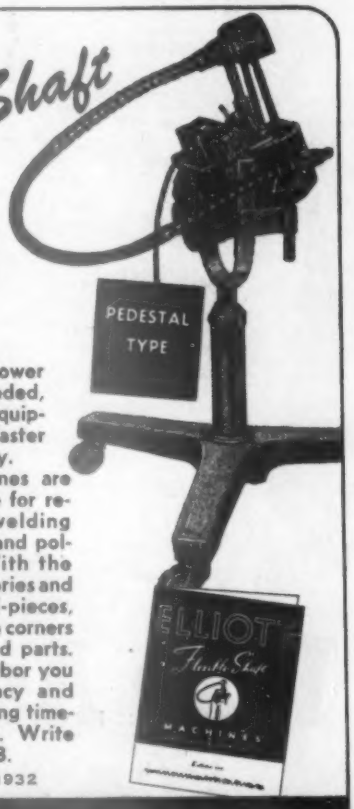
ELLIOTT *Flexible Shaft* MACHINES



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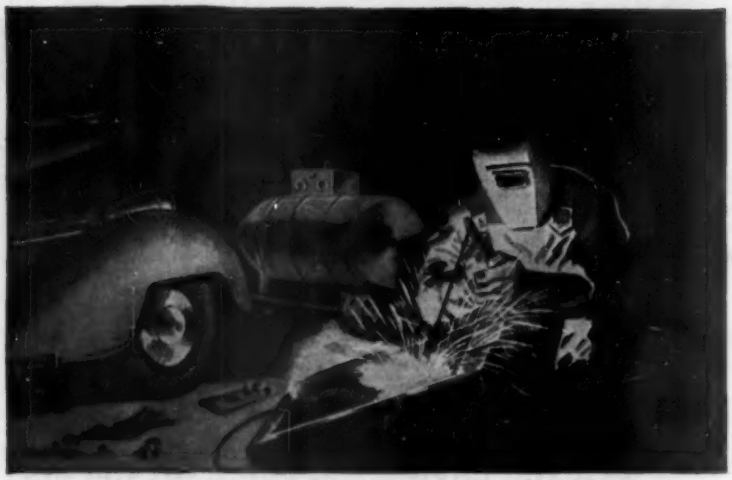

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IT'S EASY FOR THE SMALL BUSINESSMAN TO GET THEM AT A SAVING.

Hundreds of arc welders are available to small businesses for immediate delivery. Some are unused. Some are used. All were made by well known manufacturers.

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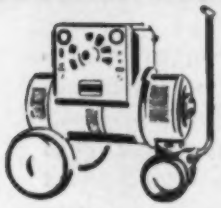
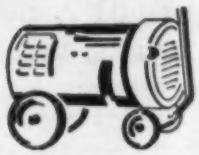
These are the type welders needed by garages, repair shops and maintenance shops. The large inventory includes welders of 200, 300 and 400 Ampere Rating, either DC or AC. They are located at various points throughout the country and may be inspected before purchase.

To obtain complete information on availability, location and condition of the equipment you want, fill out the coupon and send it to your nearest War Assets Administration Regional Office.



Hobart—Standard models of this make available in large quantities and most ratings.

Lincoln—In all models and most ratings. Many in the popular 300—400 Ampere size.



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Specify—
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HIGH-TENSILE STEEL

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Reduce Fabricating Costs and Increase Production With

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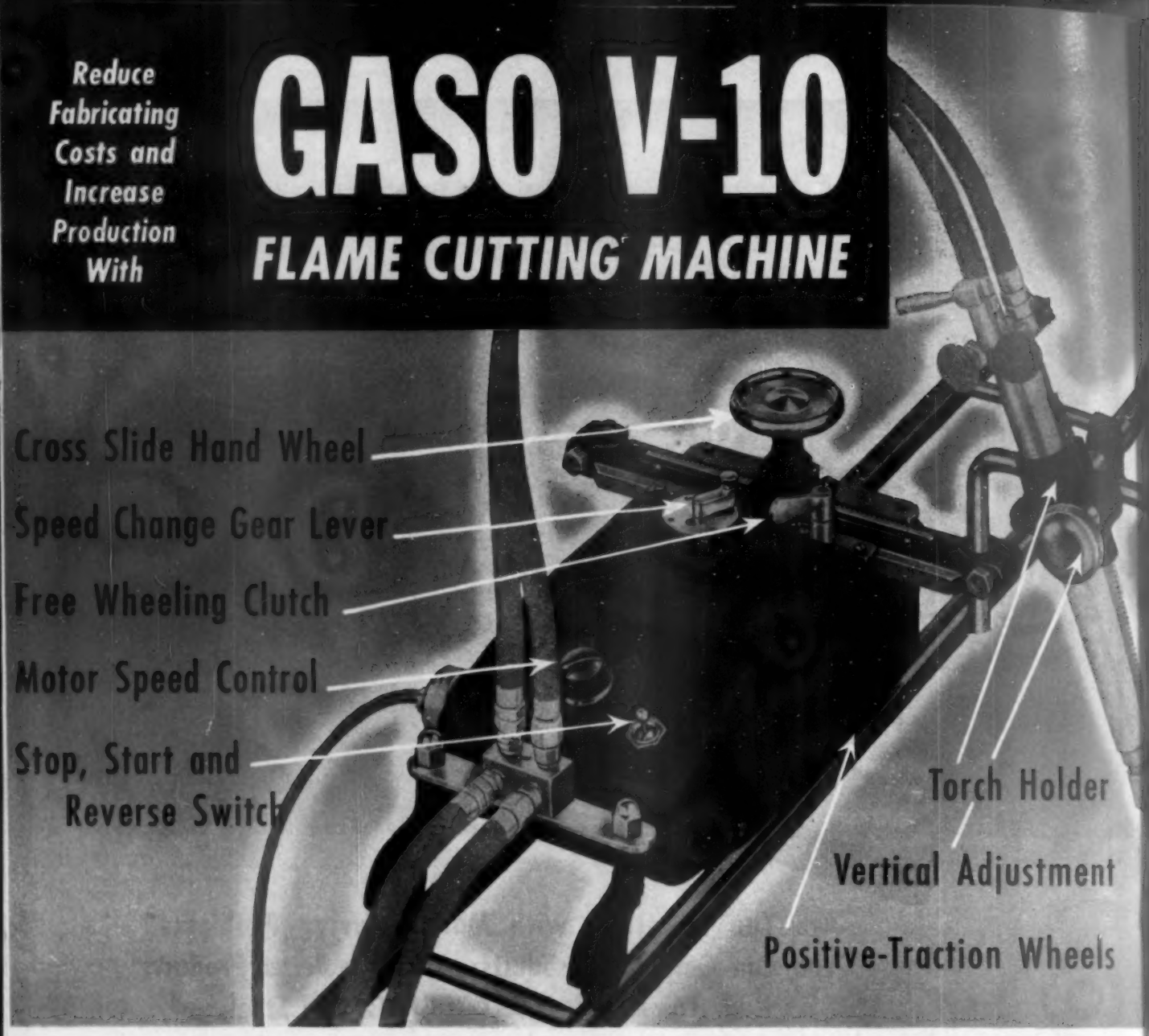
FLAME CUTTING MACHINE



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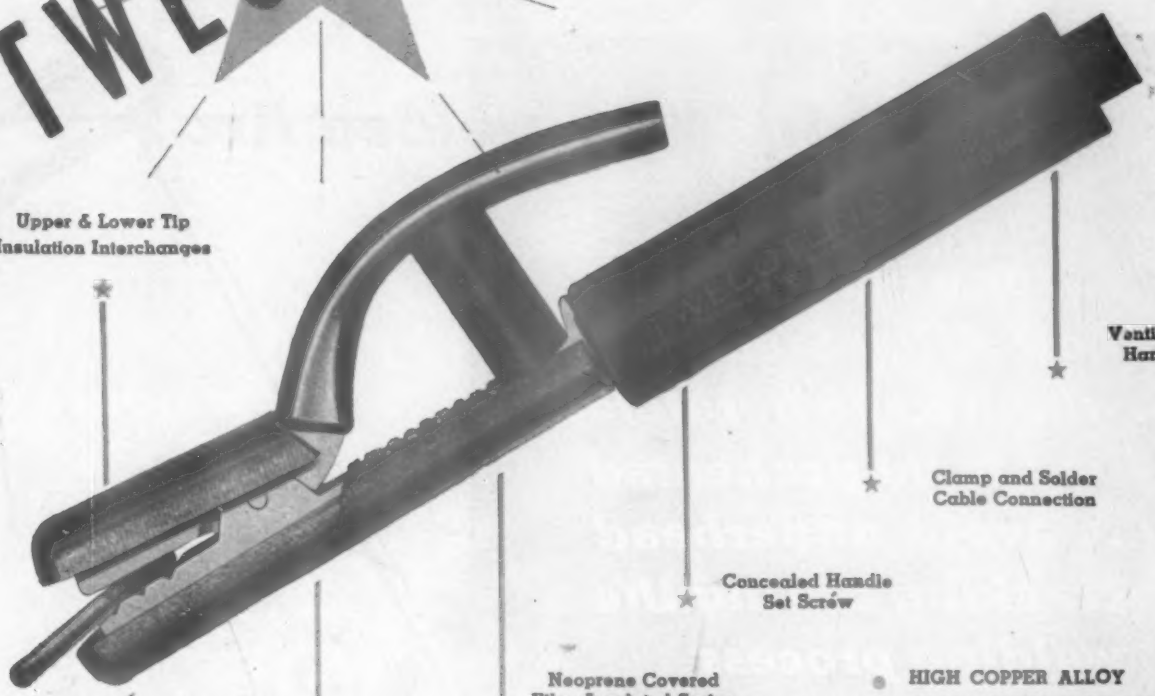
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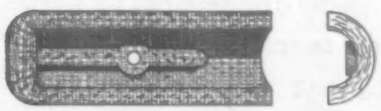

TWECOTONG insulation is exclusive in design and material. "Tubular-Keyed" construction with deep-set boss snugly locates each piece on the holder casting. Glass Cloth (laminated) Bakelite insulators withstand great impact, heat and arc burn. This combination assures maximum holder service with a minimum of maintenance. TWECOTONG is covered by U. S. Letters Patent No. 2,401,523.

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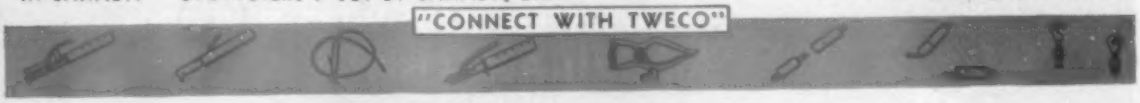

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Hi-Tensile "M" Shielded Arc

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This new PAGE Electrode may help simplify some of your welding jobs. The PAGE distributor in your territory can give you complete information about it. He can also tell you what you want to know about any other type of electrode or gas welding rod – of which PAGE offers a complete line.

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***Automatic* STUD WELDING...**

THE NELSON *Single Gun* PRODUCTION UNIT

Eliminating drilling, tapping or hand welding, the NELSON single-gun production unit automatically secures studs accurately at rates up to 25 per minute.

Work cycle is automatic; the operator merely loads the stud and protective ferrule in the gun chuck, locates the work piece, and presses a button. 6 to 8 welds per minute can be made with hand loading, and up to 25 per minute with automatic loading and locating. The standard unit handles NELSON studs from ⅛" to ¾" in diameter, up to 8" long.

The unit is available either less base fixture (as shown), or complete with locating fixtures or indexing table engineered to your requirement. Chucks, timer control, air regulator with filter, oiler and gauge, complete cable set and operating switch are furnished. Any suitable d.c. welding generator powers the welding circuit; controls operate from 110 v. 60-cycle a.c., and air at 40 lbs. p.s.i. (minimum) supplies the pneumatic cylinder.

Simple base mounting permits variation of the work opening to accommodate a wide range of work piece sizes and shapes. Current applications include installation of plain studs on cotton gin rollers (top photo), threaded studs on manhole rings (lower left photo), bosses on a quick-change valve body, and many others. In every case, the result has been higher production at lower cost—a combination you can't afford to miss!

A letter, wire or phone call will bring full information. Or, if you wish, an experienced Nelson Field Engineer will call.

NELSON

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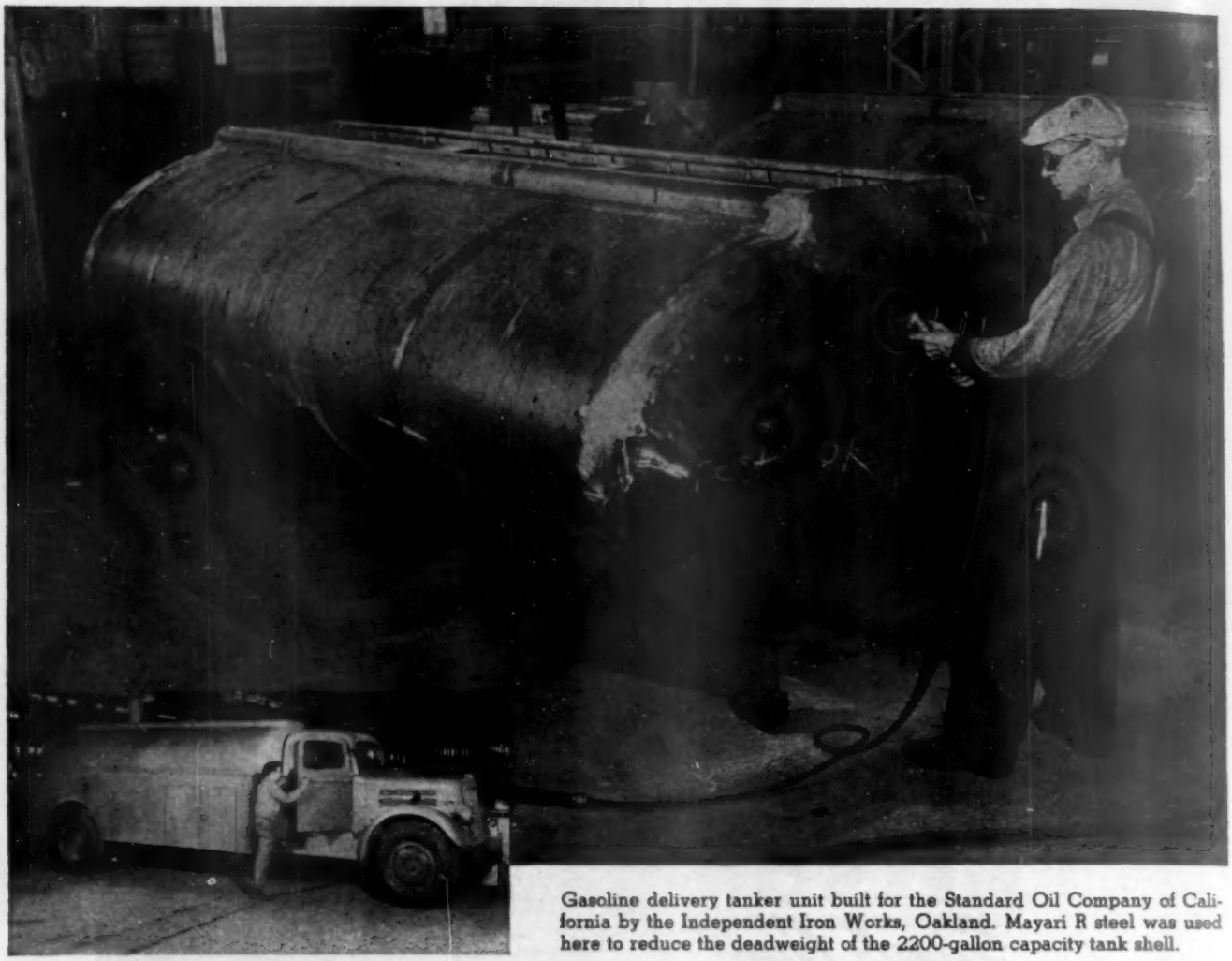


Gasoline delivery tanker unit built for the Standard Oil Company of California by the Independent Iron Works, Oakland. Mayari R steel was used here to reduce the deadweight of the 2200-gallon capacity tank shell.

Lighter shells of Mayari R for metropolitan delivery tankers

Deadweight was reduced 600 lbs in the shell of each of these metropolitan delivery truck tank units through the use of Mayari R steel.

Built previously of mild-carbon steel this 2200-gallon, four-compartment tank weighed 3800 lbs. Built now of 12-gage Mayari R the tank weighs only 3200 lbs. Lighter sheets of Mayari R allow this savings in weight without sacrificing strength.

Manufacturers of many types of automotive products find in this low-alloy, high-strength steel the mechanical properties needed for economical weight-saving design. Mayari R has a minimum tensile strength of 70,000 psi and a minimum yield point of 50,000 psi. It has high resistance to atmospheric corrosion, abrasion and impact—factors making for longer service life.

Mayari R normally costs no more to fabricate because it is formed, cut and welded with the same equipment used for carbon steel. The working methods are virtually the same, with only slight allowances needed for its higher properties.

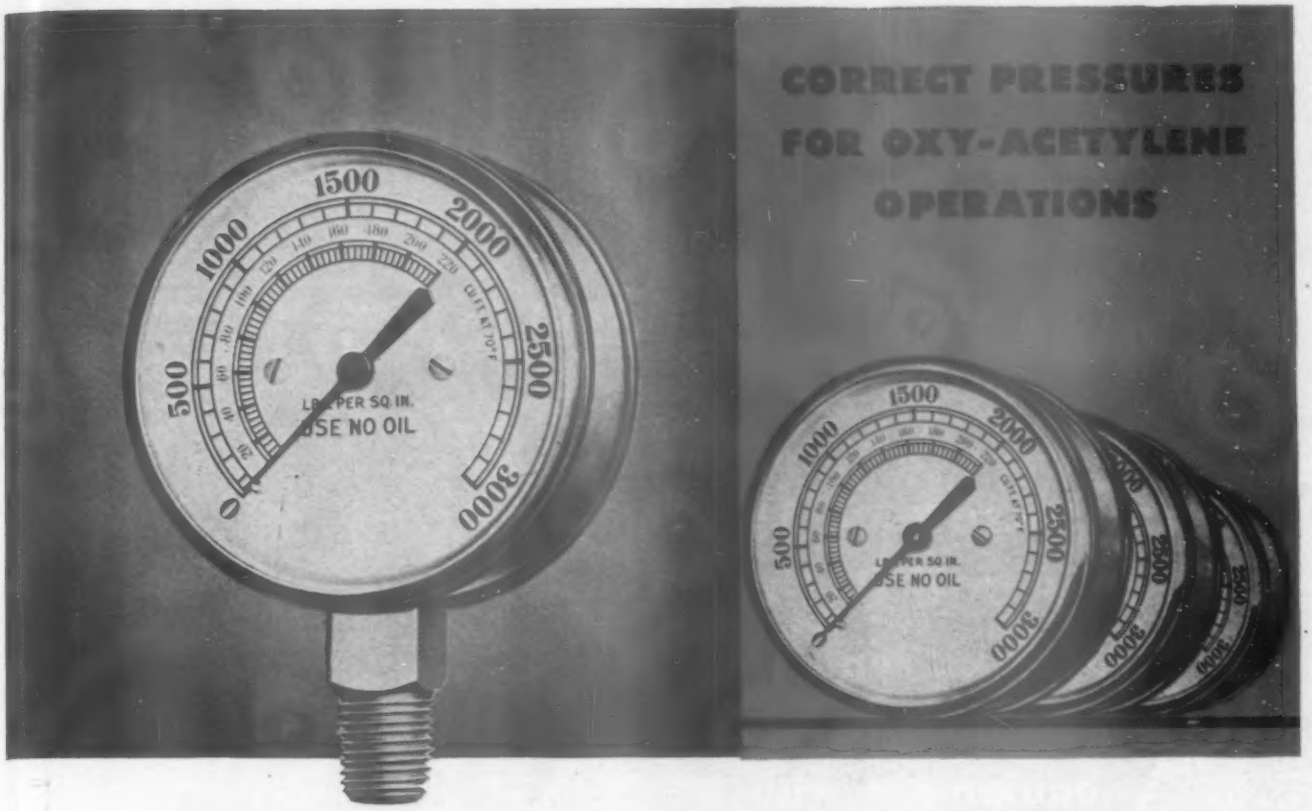
For further information on Mayari R and its many industrial applications write for Catalog 209.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation

★ BETHLEHEM STEEL ★

Mayari R *makes it lighter... stronger... longer lasting*



AUTO-LITE PRESSURE GAUGES

AUTO-LITE FOR ACCURACY

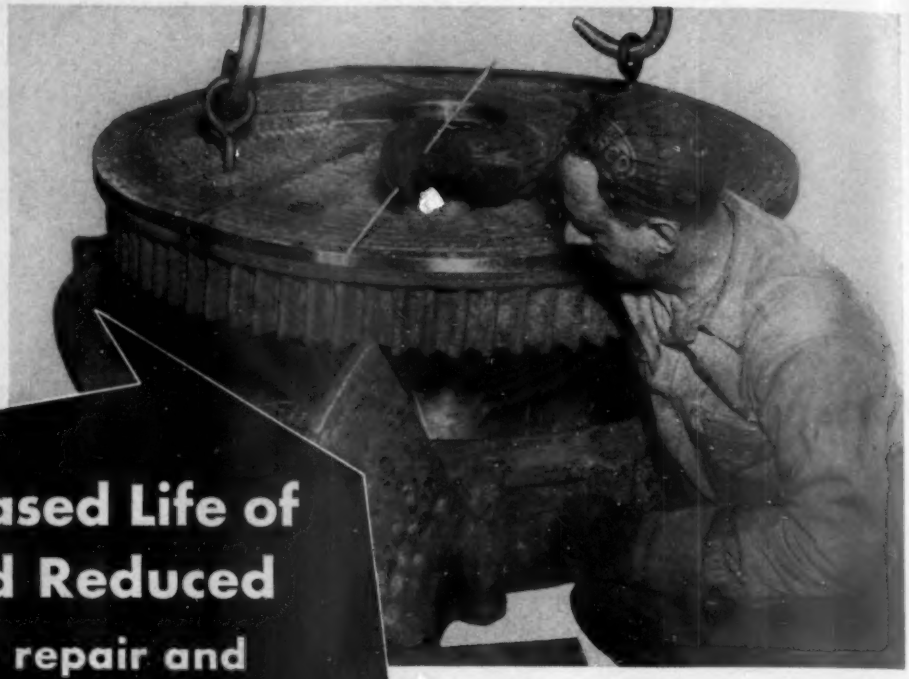
Every operator has a right to expect dependable pressure indication from the gauges on his oxy-acetylene equipment. AUTO-LITE Pressure Gauges are designed and made by an organization that pioneered in the development of dial-type precision instruments. They serve not only to safeguard the operator in his work, but to keep him working at highest efficiency. AUTO-LITE Pressure Gauges are standard equipment for oxy-acetylene apparatus, and are listed as approved by Underwriters Laboratories.

A special safety feature, exclusive with AUTO-LITE Gauges, is the grid-retainer plate at the back of the instrument. This construction gives extra protection to operator and plant equipment.

THE ELECTRIC AUTO-LITE COMPANY
INSTRUMENT AND GAUGE DIVISION • CHRYSLER BUILDING, NEW YORK 17

AUTO-LITE *pressure* GAUGES

TUNE IN THE AUTO-LITE RADIO SHOW STARRING DICK HAYMES—THURSDAYS, 9:00 P. M.—E. T. ON C B S



Rebuilt disc showing partial Phos-Trode overlay section in front and the finished machined assembly ready for service.

For Increased Life of Parts and Reduced Costs . . . repair and maintain your capital equipment with Phos-Trode

Shielded-Arc Phosphor Bronze Electrodes

PHOS-TRODE, Ampco Metal's new Phosphor Bronze Electrode, is ideal for welding cast iron, steel, bronze, and brass. It is easy to manipulate, and its dense deposit resists wear and corrosive elements. These factors account for Phos-Trode's extreme popularity throughout industry.

Shown above is a continuous grain press that is used by breweries, distilleries, and citrus industries for extracting juices and drying the grain or citrus pulp. It employs a rotating action, and its efficiency depends upon a close tolerance between the revolving circular disk and the housing — when this gap becomes too wide there is an excessive and costly loss of grain or pulp.

The segments forming the rotating disc are made of bronze or cast iron. When they become worn, Phos-Trode is overlaid and then machined, restoring the worn surfaces to their original dimensions.

The rebuilt discs, thanks to Phos-Trode, serve as long as the original equipment. The savings from this practice are sizeable. Try repair and maintenance welding with Phos-Trode everywhere you can. Enjoy reduced part replacement costs. Call on your Ampco field engineer, or send coupon for latest Phos-Trode Bulletin.

AMPCO METAL, INC., Department WE-12, Milwaukee 4, Wisconsin

Please send me complete information about Phos-Trode.

Name..... Position.....

Company.....

Address..... ☐ Home ☐ Office

City..... (.....) State.....

AMPCO

Phos-Trode is a product of

Ampco Metal, Inc.

Milwaukee 4, Wisconsin

Field offices in principal cities

W-93

Replace with RCA Thyratrons

RCA-5559
Directly interchangeable with FG-57 & WL-631

RCA 2D21

RCA-3C23
Directly interchangeable with GL-3C23

RCA-672
Directly interchangeable with WL-672

RCA 2050

- For Ignitron Firing
- Relay Circuits
- Regulated-rectifier applications

Directly interchangeable with other standard types

There is an RCA Thyratron for practically every purpose in welding-control units, electronic relaying equipment, and grid-controlled rectifier apparatus.

The RCA Thyratrons illustrated are representative of a large and growing family of RCA electron tubes for industrial use. At present, there are over 200 *standard* types. Included in this group is a comprehensive line of ignitrons, power amplifiers for high-frequency heating equipment, and an equally comprehensive line of high-vacuum and mercury-vapor rectifiers for low- and high-voltage applications.

RCA electron tubes for industrial use are rugged, and provide the high quality and long service life required for continuous-duty applications.

When you need renewal tubes, look to RCA.

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Radio Corporation of America
Commercial Engineering
Section IR-33L, Harrison, N. J.

Please send me Bulletin No. 2F237 covering prices, technical description and interchangeability by type numbers of the complete line of RCA industrial electron tubes.

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City_____ Zone____ State_____

RCA LABORATORIES
PRINCETON, N. J.

IN RADIO AND ELECTRONICS—*THE FOUNTAINHEAD OF MODERN TUBE DEVELOPMENT IS RCA*

TUBE DEPARTMENT

RADIO CORPORATION of AMERICA

HARRISON, N. J.

Made the Way the Welders Want Them

A-O'S TX100

WELDERS' GLOVES

The TX100 Gunn-cut full gauntlet glove of chrome tanned cowhide leather is a masterpiece of designing for *complete* protection. It has a one-piece back, eliminating all vulnerable seams, a double thickness of leather on the thumb and first finger to resist wear from rod and torch handling, and is lined on the back of the hand from wrist to finger tips. Flexible and comfortable, it will give long service in hard usage. Your nearest A-O Safety Representative can supply you.

American Optical
COMPANY
Safety Division

SOUTHBRIDGE, MASSACHUSETTS
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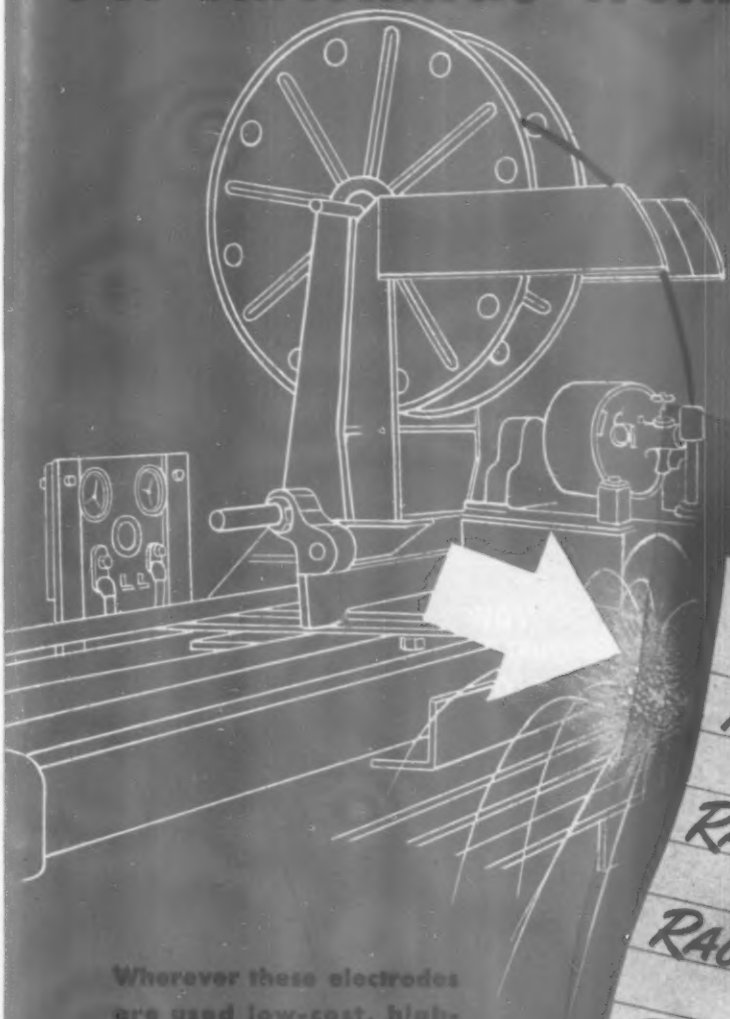
For Automatic Welding Use these

RACO ELECTRODES



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RACO TYPE D-E-4520

RACO TYPE D-KNURLED

RACO TYPE M-E-4520

RACO-BARE OR COPPER COATED WIRE FOR SUBMERGED ARC WELDING

Wherever these electrodes are used low-cost, high-quality welds result. This is the experience of every manufacturer who has put RACO Automatic Electrodes to work. These electrodes are highest quality — they are unusually fast, and produce welds that are clean, strong and sound. Write today for complete data.

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INCORPORATED
DUNDALK • BALTIMORE 22 • MARYLAND
SINCE 1919 PRODUCERS OF ARC WELDING ELECTRODES AND WELDING RODS

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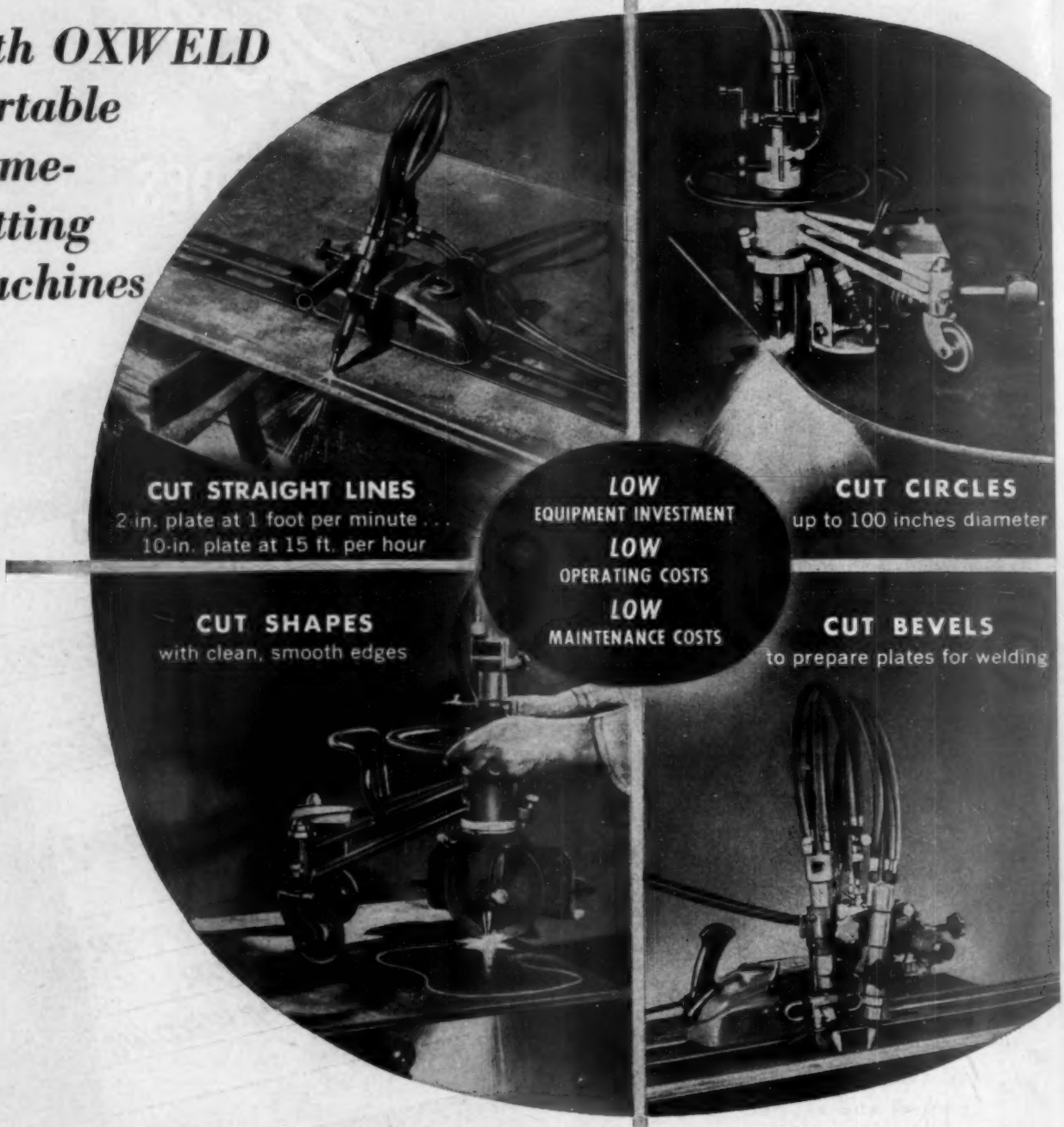
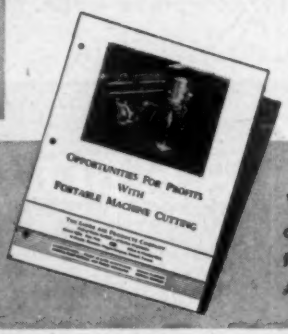
with OXWELD portable flame-cutting machines



Call or write any Linde office for a catalog and prices



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The world "Oxweld" is a registered trade-mark of Union Carbide and Carbon Corporation.

WORLD'S LARGEST DIPPER

WELDED WITH

ARCALOY Type 312

Stainless Steel Electrodes

Greater strength and weight saving, required for the construction of this mammoth dipper, were made possible by the use of new war-developed alloy steels and Arcaloy Type 312 Stainless Steel electrodes.

The deposit of these electrodes "as welded" has a tensile strength of 120,000 lbs., yield strength of 90,000 lbs., and 25% elongation in 2 inches—characteristics essential for successful fabrication of the dipper.

FOR COMPLETE INFORMATION ON ARCALOY ELECTRODES, WRITE TO ALLOY RODS COMPANY TODAY.

ALLOY RODS

ALLOY RODS CO., YORK, PA.

Constructed by the Marion Power Shovel Company, Marion, Ohio, the world's largest dipper can take a 40 cubic yard "bite."

EUTECTIC ADAPTS ITS WELL KNOWN TO ARC WELDING!

A NEW LINE OF SPECIAL *"LowTemp"* EUTECTRODES TO LICK ALL "HARD-TO-ARC WELD" PROBLEMS IN CAST IRON, STAINLESS STEEL, COPPER, AND ALUMINUM ALLOYS

EUTECTIC'S OUT FRONT WITH THIS STAR HEADLINER!

—first in a line of revolutionary electrodes

A NEW DEVELOPMENT FROM THE EUTECTIC RESEARCH LABORATORIES *—that's a step ahead in arc welding!*

FROM the research laboratories of the originators of the revolutionary "*Low Temperature*" WELDING RODS* comes another remarkable achievement — "*LowTemp*" EUTECTRODES — a complete line of flux-coated electrodes for metal arc welding at *lower base metal temperatures*.

"*LowTemp*" EUTECTRODES have been developed to solve difficult welding problems on practically every type of metal. No longer is it necessary to use hot, digging-in method — thus the ill-effects of high heat have been greatly reduced. A special "*LowTemp*" flux coating insures immediate bonding of the weld deposit to the base metal. You'll get strong, smooth welds faster, better, more economically.

For ease of identification, the type of rod and its use is clearly stamped on each EUTECTRODE—another unique EUTECTIC feature! Solve your hard-to-lick arc welding problems with one of the appropriate "*LowTemp*" EUTECTRODES. MAIL COUPON ON OPPOSITE PAGE FOR FULL DETAILS.

USE THESE AMAZING *"LowTemp"* EUTECTRODES TO SOLVE YOUR PROBLEMS

EUTECTRODE 24 (AC-DC) for CAST IRON, "Cold", no preheating, machinable.

EUTECTRODE 24B (AC-DC) for CAST IRON, corrosion-heat resistant, machinable.

EUTECTRODES 28 (AC) and **280** (DC) for BRONZES, BRASSES, fabrication, repair, amazingly dense.

EUTECTRODES 30 (AC) and **300** (DC) for COPPER, smooth, dense welds.

EUTECTRODES 29 (AC) and **290** (DC) for REDDISH and SILICON BRONZES, smoothest welds.

EUTECTRODE 2100 (DC and Gas) for ALUMINUM, ideal for sheets, castings.

EUTECHROM group for maximum hardness to protect easily worn surfaces (ferrous only)

EUTECTRODE 2 for GENERAL USE.

EUTECTRODE 4 for MANGANESE STEEL, impact.

EUTECTRODE 6 for TOOLS, KNIVES, DIES.

EUTECTRODE 8 for CORROSION and HARDNESS.

EUTECTRODE 12 for DRILLING, EARTH MOVING PARTS.

EUTECTRODE 130 for CAST IRON.

Low Temperature WELDING RODS*

STAINLESS "LowTemp" EUTECTRODES for stainless steels

These amazing Stainless "*LowTemp*" EUTECTRODES coated with a specially developed flux, magically surface alloy the molten drops of weld metal to the base metal — at lower base metal temperatures!

This remarkable development avoids deep penetration into the base metal, and the ill-effects that result from large over-heated areas — which are characteristic of ordinary, high heat welding methods.

EUTECTIC Stainless "*LowTemp*" EUTECTRODES possess all the beneficial qualities of stainless steel, including exceptional resistance to corrosion and oxidation. Smooth, neat deposits are easily obtained at exceptionally high speed, with no spattering, undercutting or overlapping.

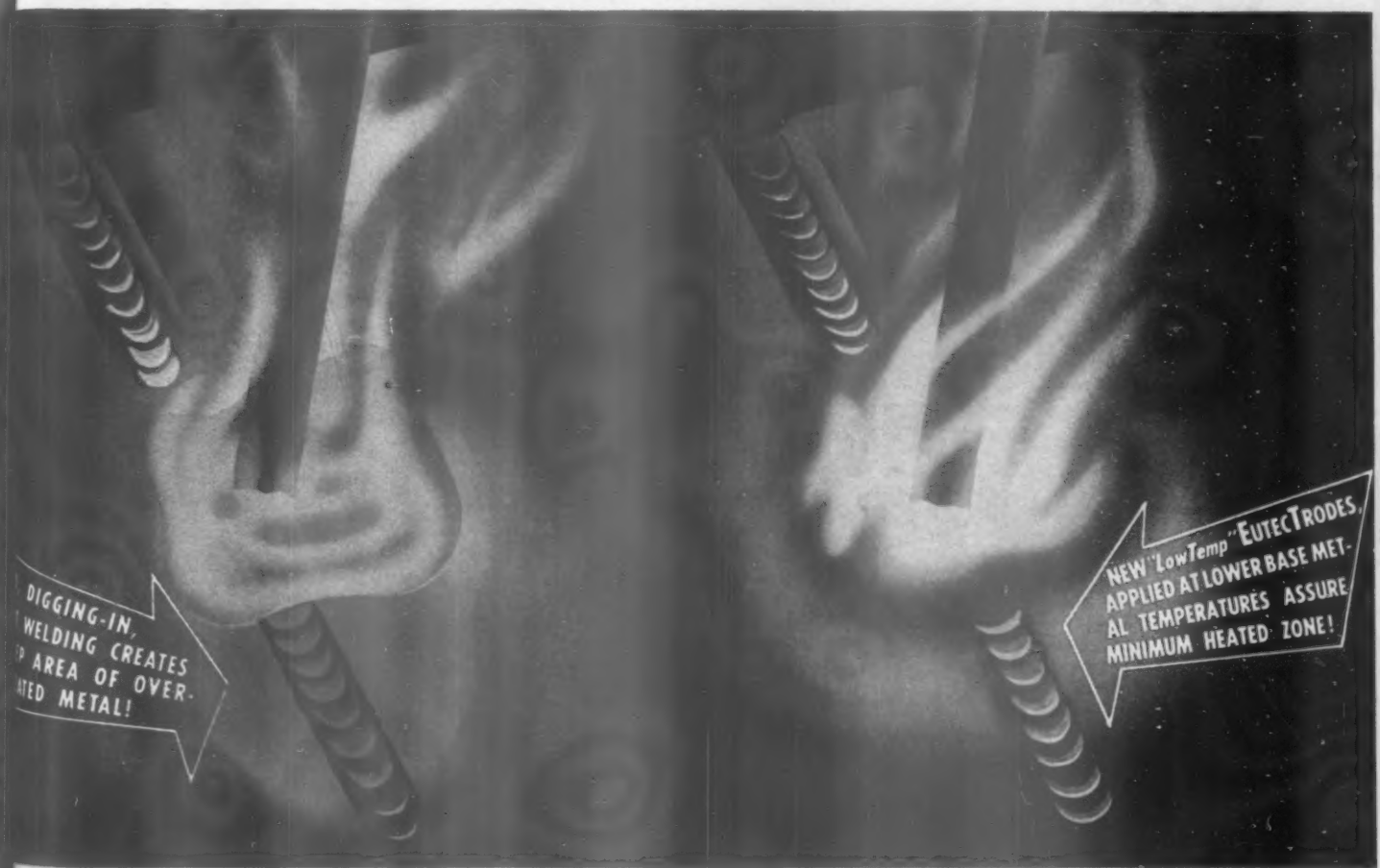
Stainless "*LowTemp*" EUTECTRODE 18/8 for stainless steel, types 301, 302, 303, 304, 308, 321, 347. Contains columbium. For DC use. AC rods upon request.

Stainless "*LowTemp*" EUTECTRODE 25/12 for stainless steel type 309, and stainless clad steel. For DC use. AC rod upon request.

Stainless "*LowTemp*" EUTECTRODE 25/20 for stainless steel type 310. For AC-DC use.

EUTECTIC "*LowTemp*" EUTECTRODES

are new types of metal arc welding electrodes which— *1. Weld at lower base metal temperatures. 2. Deposit welds at exceptionally high rates of speed. 3. Form welds equal to or better than base metal.*


DIGGING-IN, WELDING CREATES AREA OF OVER-ATED METAL!
NEW "LowTemp" EUTECTRODES, APPLIED AT LOWER BASE MET-AL TEMPERATURES ASSURE MINIMUM HEATED ZONE!

Castolin Eutectic

140 Field Engineers in all principal cities of the United States and Canada to serve YOU.

*Trade Mark Reg. U.S. Pat. Off.

SOLD ONLY BY THE MANUFACTURERS

EUTECTIC WELDING ALLOYS CORPORATION

Originators of *Low Temperature* WELDING ALLOYS*

40 WORTH STREET NEW YORK 13, N. Y.

PLEASE SEND DETAILS OF "*LowTemp*" EUTECTRODES FOR Dept. WE-1

☐ CAST IRON ☐ STAINLESS STEEL ☐ COPPER
☐ ALUMINUM ☐ BRASSES, BRONZES ☐ EXTRA-HARD OVERLAYS

Name..... Company.....

Address.....

"Always a Pin Point Flame"

You Can't Beat a SUPER WELDMASTER For GENERAL TORCH Service

Meco

You'll find this model an excellent piece of equipment for general all 'round welding service. It is far lighter in weight than the old-fashioned torches and has many exclusive features, a few of which are given below:

1. Tips are equipped with patented protecting seat design to prevent damage to seating area. Tips produce a pin point flame. Sizes 00 to 12 inclusive.
2. Varied head lengths are available—3½", 6" and 8½" lengths.
3. Circle mixer provides proper proportion of mixed gases for all tip sizes. It produces a longer, hotter flame with low gas pressures and consumption.
4. Gasket type joint insures tight joints and simplifies repairs.
5. Correct balance in design makes for easier day in and day out usage.

You'll Find It An Excellent Companion Piece to Use With the Weldmaster Cutting Attachment.

MODERN ENGINEERING COMPANY, Inc.

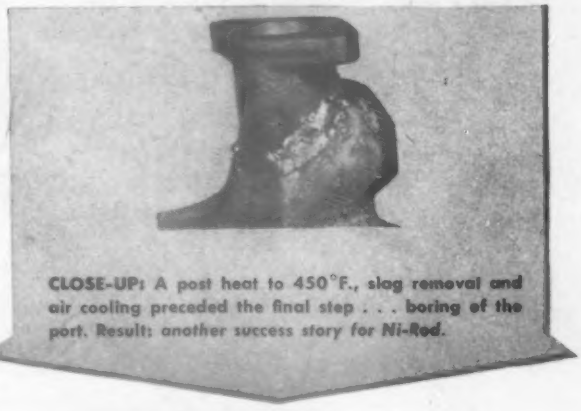
3411 PINE BLVD. **ST. LOUIS 3, MISSOURI**

What... Remodel Iron Parts Already Cast?

Yes, right on the production line ...with NI-ROD

BEFORE: Here's the original cast iron manifold and the extra port. After inspection of both parts, the manifold was preheated to 450°F.

AFTER: Using a jig, the port was mounted at a 3½° angle and "spotted" in 3 places. A continuous weld then completed the job.



CLOSE-UP: A post heat to 450°F., slag removal and air cooling preceded the final step . . . boring of the port. Result: another success story for Ni-Rod.

Here's an interesting Ni-Rod* case history . . .

It shows how easily Ni-Rod can simplify design changes and speed production.

Grey iron manifolds like the one at the top became outmoded when an additional port was required.

But, quickly and easily, Candler-Hill Corporation, of Detroit, remodeled the manifolds on hand, using Ni-Rod.

Saving time, money and labor . . . this company cut a correctly located hole in each casting, then welded on a secondary port using an a.c. transformer-type welder drawing 160 amperes.

Since other rods gave less favorable results, Candler-Hill was particularly gratified with Ni-Rod. It speeded-up the process, required less preheat and post heat, and the machinability of the weld allowed quick boring of the port. Position of ports was held within ± ½°, and all other dimensions were held within ± .003".

Try a 5-lb. package of Ni-Rod. Use it on a.c. or d.c., and see how easy it is to get strong, sound, machinable welds in cast iron.

*Reg. U. S. Pat. Off.

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67 Wall Street, New York 5, N. Y.

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ATLAS DUAL CASE

Carrier Case for Electrodes and Weld Cleaning Tool

Case carried on welder's belt by means of loop—Prevents chipping electrode flux, keeping electrodes and cleaning tool at welder's hand.

Electrode capacity 8 lbs. Heavy Harness Leather Construction.

Write for Descriptive Circular.

Tough as they come

Engineered Tools of Perfect Balance, Correct Weight; ENDURO Hardened

YOUR DEALER *will be glad to recommend the ATLAS Weld Cleaning Tool best adapted to your requirements.*

ATLAS WELDING ACCESSORIES COMPANY

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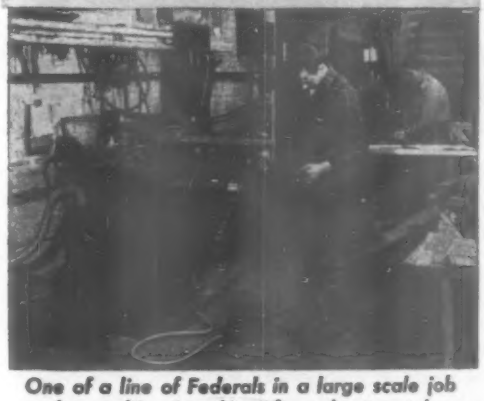
When Production Planning Sheet Metal Goods REMEMBER..

Federal Welders Raise Standards of Metal Fabrication... In Small Shop or Large Plant

For production welding of freeze boxes or furnaces, stoves or store fixtures, all types, all sizes.

Another production line application of Federal Rocker Arm Spot Welders.



One of a line of Federals in a large scale job shop making "anything" from sheet metal.

The business of making things from metal has come a long way since the days when everything from rainspouts to refrigerator liners was roll-seamed and soldered, not too many at a time, by craftsmen known (with all due respect) as "Tin Knockers". Today Federal Spot Welders play a big role in making Metal Fabricators out of such craftsmen.

In the smallest shops... the largest plant... Federal Spot Welders are speeding and improving fabrication of tremendous tonnages of metal. Variety of production is from small "tack on" jobs, accomplished with amazing speed, to assembly of full-size cabinets, lockers, boxes or what have you. Cuts in costs and "ups" in production are the rewards in each application. Try it on YOUR fabrication.

FOR SPECIAL DELIVERY

Current production permits early shipments on these models PA 1 Press Type Welders —Rocker Arm Spot Welders Subject to Prior Order.

THE Federal MACHINE AND WELDER CO.

SUBSIDIARIES

Hammer and Adams Co., Cleveland—SPECIAL HIGH PRECISION MACHINES

The Warren City Mfg. Co., Warren—WARCO PRESSES and PRESS BRAKES

Can You Pick THE RIGHT ELECTRODE?

YES, IT'S EASY because you purchase Allis-Chalmers electrodes according to *American Welding Society* number. They're easy to remember and easy to buy!

Trade names and numbering codes as used by numerous electrode manufacturers have created puzzling situations. One standard rod, for example, has over *twenty* different trade names — with no two names even vaguely similar.

But Allis-Chalmers electrodes are made and sold according to definite AWS standards . . . and every electrode is assigned its *official* AWS classification number.

Used by the ton every day in A-C's own huge plants these electrodes are constantly research-tested and production-proved. They *have* to be good! Ask for them at our nearby welder dealer or A-C sales office.

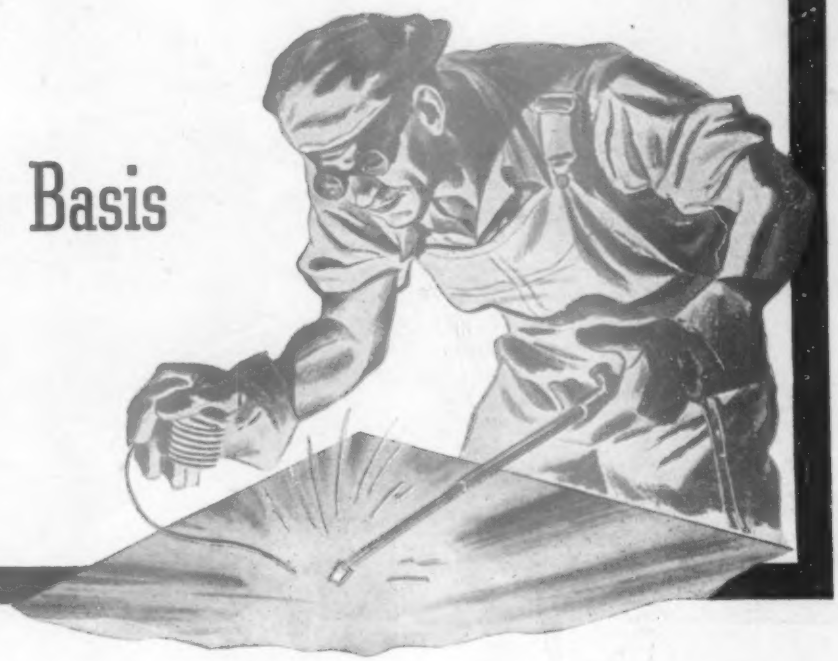
A 2044

ALLIS-CHALMERS

One of the Big 3 in Electric Power Equipment —
Biggest of All in Range of Industrial Products

Headquarters for all arc welding equipment.
ALLIS-CHALMERS,
MILWAUKEE 1, WIS.

Put Aluminum Joining on a Production Basis



Proper procedures for welding and brazing aluminum have been established by Alcoa. Equipment suitable for manual and automatic operation has been developed by various manufacturers. Workers are now skilled in these processes. All combine to help you put assembly operations on a production basis, speeding up this work, cutting costs, and raising product quality.

JOINING METHODS ARE

Welding by gas, metallic arc, tungsten arc, automatic and manual carbon arc, and atomic hydrogen. Electric resistance welding—spot, seam, and butt-flash processes. Brazing—furnace, torch, and flux-dip methods. Alcoa has the aluminum alloys and the welding and brazing supplies you need for any of these methods. Be certain that each is suited to the application, and that the quality is of the highest. Specify "Alcoa".

The book, "Welding and Brazing Alcoa Aluminum", contains how-to-do-it data useful for experienced workers and for the man who "didn't know you could weld aluminum". Send for a copy today.

ALCOA OFFERS JOINING HELP

Success of your welding and brazing operations depends upon these factors: Parts must be properly designed. Joining techniques must be correct. Materials employed must be right. For advice on all three, call the nearby Alcoa office, or write ALUMINUM COMPANY OF AMERICA, 1751 Gulf Building, Pittsburgh 19, Pennsylvania.

ALCOA FIRST IN **ALUMINUM**

IN EVERY COMMERCIAL FORM

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NCG is recognized as one of the largest organizations of its kind in the world. It operates 73 manufacturing plants within the United States, offers supply from more than 700 warehouse stocks and service by a vast network of hundreds of independent NCG distributors. For assured satisfaction in *your* welding needs . . .

RELY ON NCG

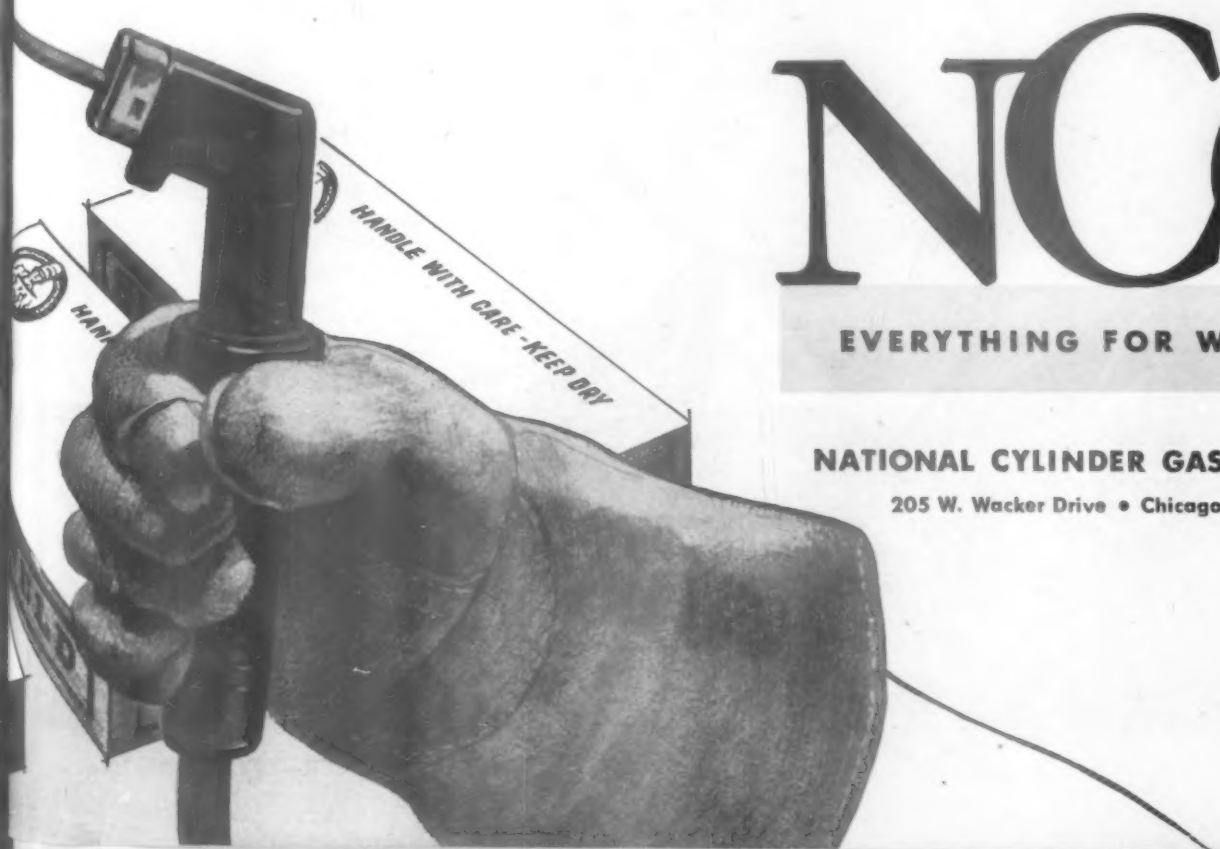
MILES...

of welding satisfaction

Consistently through the years, the Hollup division of NCG has been one of the largest producers of arc welding electrodes. During the last decade alone, the production of SUREWELD Electrodes would encircle the world some 200 times. Borrowing a well-known advertising slogan, "Such popularity *must* be deserved". It must be evident that such volume could only be possible for a product that possessed *unusual* merit.

The many users that insist on SUREWELD Electrodes give many reasons for their preference. Most frequently stated is, "Reliably uniform performance". This is more than a happenstance. SUREWELD Electrodes are the product of the most modern electrode manufacturing plant in the world. To see it in operation is to know why SUREWELD Electrodes *must* be better. The high-precision equipment that makes SUREWELD Electrodes was designed and built by NCG's Hollup division engineers. It has no counterpart in the industry. Further, both the metals and the coatings used for SUREWELD Electrodes are held under the most precise laboratory control through *every* step from mill to the SUREWELD carton.

For the utmost in welding satisfaction, you too will find it pays to insist on SUREWELD. Hundreds of authorized distributors are ready to serve you. And NCG welding experts are always at your call for able and unbiased consultation.



NCG

EVERYTHING FOR WELDING

NATIONAL CYLINDER GAS COMPANY

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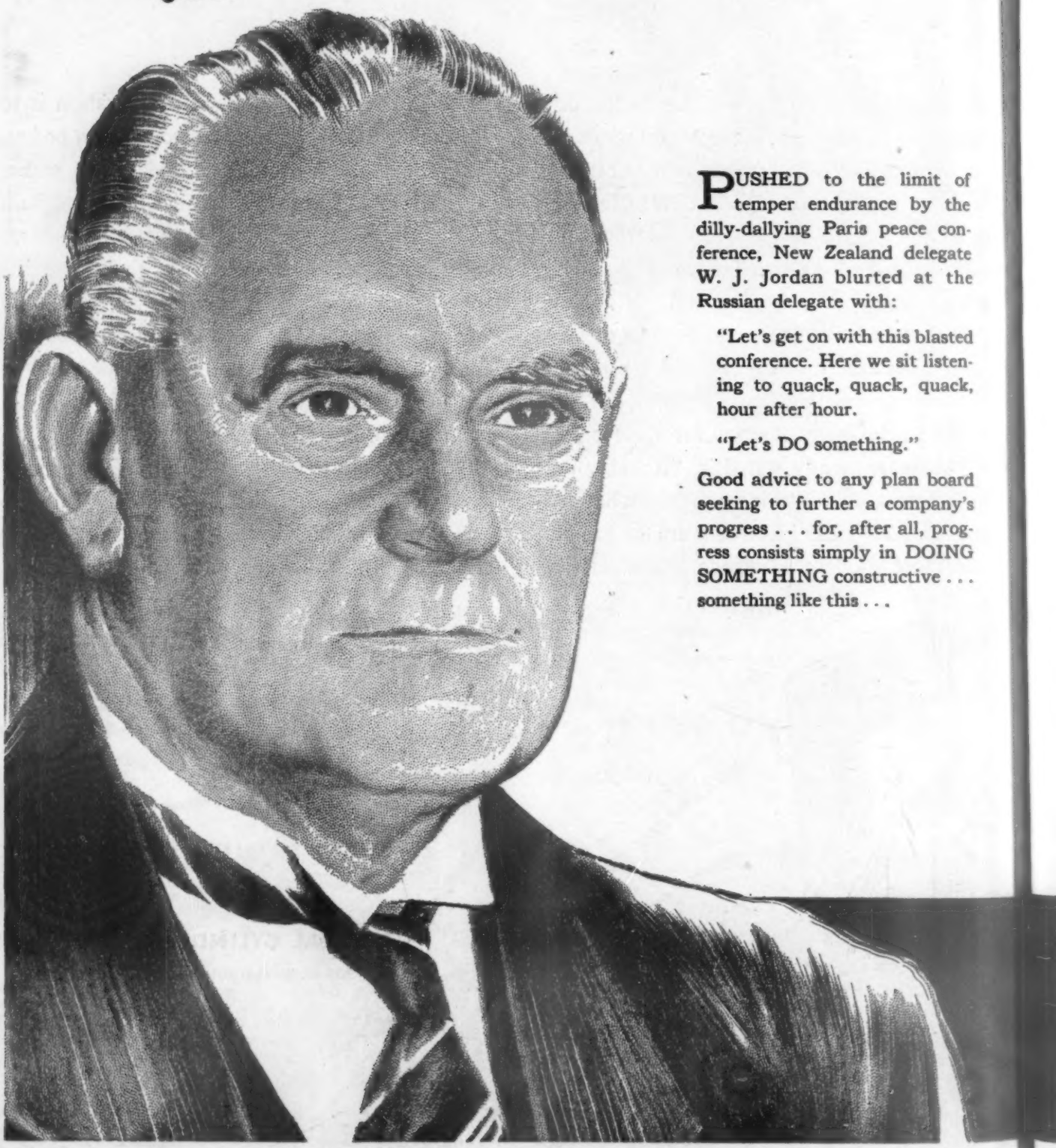
then he said to himself:

"*!!#*...DO SOMETHING!"



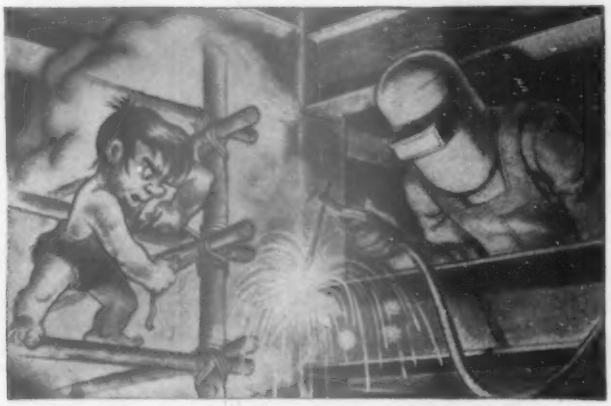
PUSHED to the limit of temper endurance by the dilly-dallying Paris peace conference, New Zealand delegate W. J. Jordan blurted at the Russian delegate with:

> "Let's get on with this blasted conference. Here we sit listening to quack, quack, quack, hour after hour.
>
> "Let's DO something."

Good advice to any plan board seeking to further a company's progress . . . for, after all, progress consists simply in DOING SOMETHING constructive . . . something like this . . .

Look, Mr. Jordan, **how Lincoln is helping engineers, production men and executives DO SOMETHING constructive with arc welding:**

CUT WELDING COSTS. To help supervisors and foremen use arc welding more economically, Lincoln publishes a series of procedure sheets and will send these on request. Procedure bulletins on manual and automatic welding are available to engineers and supervisors. Write us, stating your particular application.



SOLVE DESIGN PROBLEMS. The Lincoln sound-color movie, "Design for Arc Welded Structures" depicts the progress of construction from cave man days . . . is packed with ideas for design and lower costs. Full details in Bul. 719. "The Prevention and Control of Distortion in Arc Welding", explains the causes and cures of distortion. Ask for Bul. 709.

LEARN FROM OTHERS. The Lincoln library of arc welding knowledge includes the world's leading books on all phases of the subject. New 8th Edition Procedure Handbook contains 1312 pages of latest facts gathered by experts the world over. Price, $1.50 (postpaid in U.S.A.). Write for free Bul. 713 and Bul. JFLF 128 on Lincoln books.

ASK FOR ADVICE. Mr. R. H. Davies, Consulting Engineer of The Lincoln Electric Company, will come to your plant for three days or longer for an advanced course in welding engineering and to discuss welded design as applied to your problems. Write to R. H. Davies for details. The cost for this service is small.

THE LINCOLN ELECTRIC COMPANY • Dept. 39 • Cleveland 1, Ohio

America's greatest natural **recourse**

ARC WELDING

P&H

"FW"... "DRAG IT!"

FOR FILLET WELDING

FOR GREATER WELDING SPEED

"FW" speeds welding and reduces operator fatigue because it "rides" on its coating. You strike an arc — and "drag it" lightly over the metal. It's that simple!

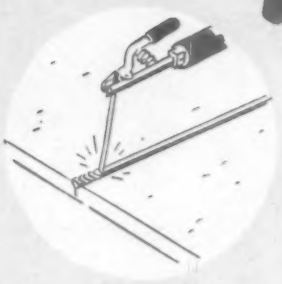
"FW" fills in the long gap between class E-6012 and E-6020 electrodes. It has the same qualities for poor fit-up as 6012 — the fast freezing, and ability to weld out of position. Yet it gives you the speed, ease and finished weld appearance of the best in the 6020 class.

P&H designed this electrode for today's fillet welding requirements. It's for AC or DC welding of medium and mild steels. Try "FW" on your work. Call your P&H representative today for demonstration.

P&H Welding Positioners

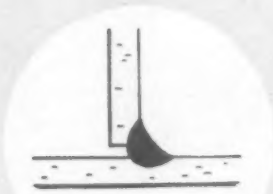
Reduce your welding costs by permitting operators to raise, tilt or rotate the work for fast, easy downhand welding. Use larger electrodes for faster deposition of weld metal. P&H Welding Positioners are available up to 36,000-pound capacity. Ask for literature. Below 2500-pound capacity, Bulletin P2-1; above, Bulletin P1.

for Faster Welding



JUST "DRAG" THE ELECTRODE

Welding is easier with "FW". No arc gap to worry about. Electrode actually "rides" on its coating. Fatigue is reduced. Operators weld better and faster.



FAST FREEZING

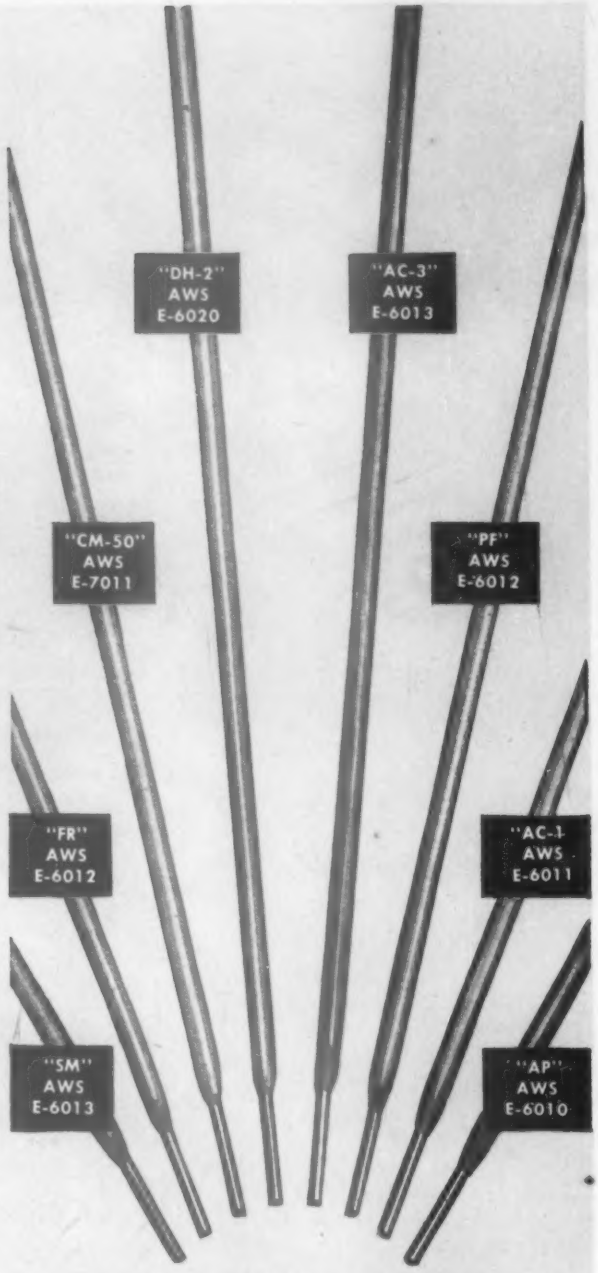
Poor fit-ups are no problem with "FW". Its fast freezing means better results. You get fine concave fillets—smooth appearance.

OUT-OF-POSITION WELDING

Although "FW" is a downhand electrode, it can also be used for out-of-position welding by experienced operators. This saves more time — is another reason for its wide acceptance.

GOOD APPEARANCE

You get smooth, uniform welds with "FW" — even over irregular and poor-fit joints. It's the ideal electrode for machine bases, farm and road machinery, structural work, etc.



P&H ELECTRODES FOR *EVERY* REQUIREMENT

Whatever your welding needs, you can choose the correct types and sizes from the complete P&H line. Above are shown a few of the P&H mild steel group. A complete line for welding stainless and alloy steels, as well as for hard surfacing, is also available.

CALL YOUR P&H REPRESENTATIVE

P&H makes a production-proved electrode for every welding requirement: for all mild, alloy and stainless steel applications cast iron and for building up and hard surfacing.

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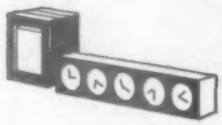

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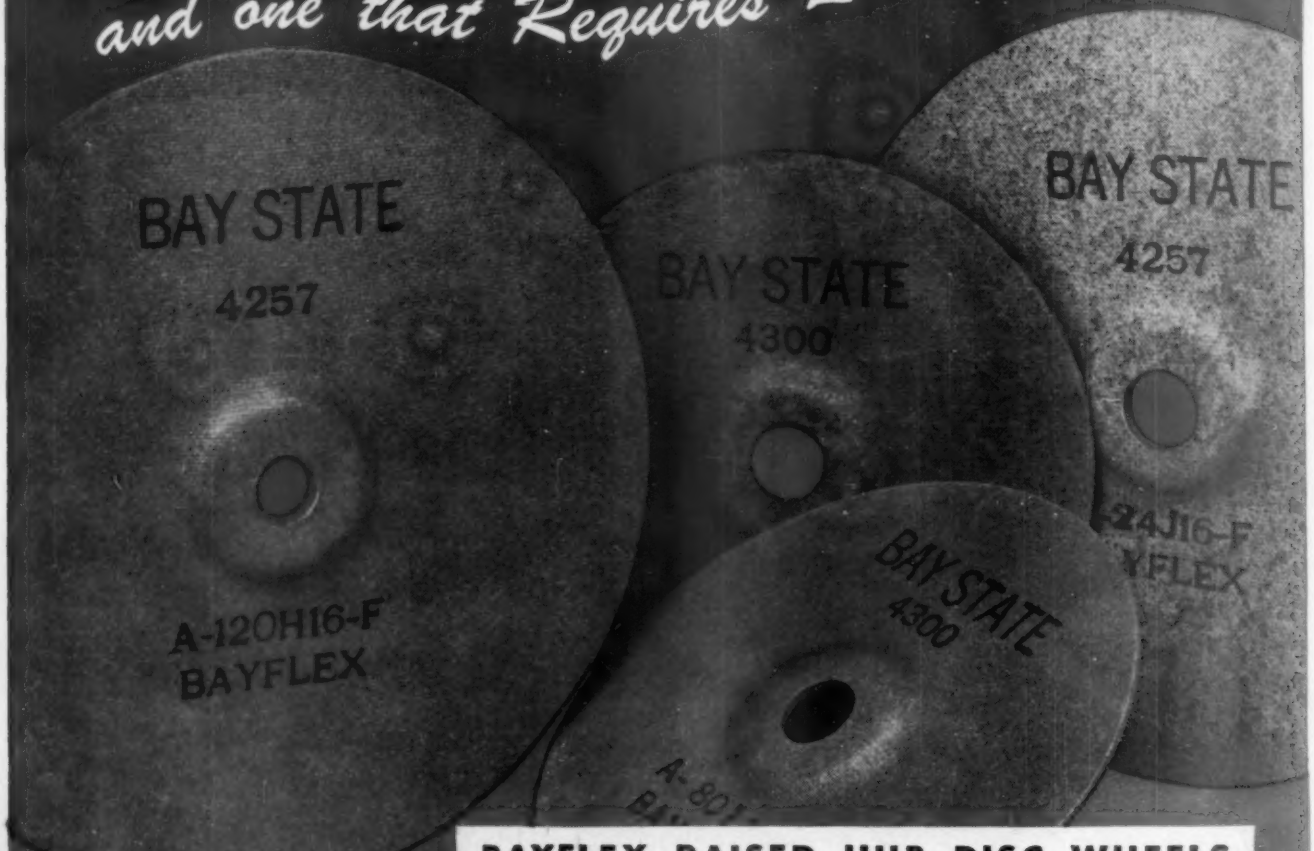
and one that Requires Less Changing



BAYFLEX RAISED HUB DISC WHEELS

are outwearing coated abrasive discs on thousands of jobs. This is really good news for foundries, welding shops, sheet metal shops, automobile and truck body repair shops, or wherever grinding and polishing of any type of welded or brazed metal is a problem.

ADVANTAGES:

1—Flat surface and edge can be used for grinding. Edge can also be used for cutting off.
2—Excellent for grinding aluminum castings.
3—No "loading" under normal conditions.
4—Unexcelled for grinding into grooves and corners, and large radii on castings.
5—Will fit any standard machine using coated discs.
6—Bayflex discs, unlike coated discs, can be used efficiently right down to the nut. This means time and money saved.
7—Available in a variety of abrasive grit sizes.

A trial will prove their worth. Write for bulletin for further information.

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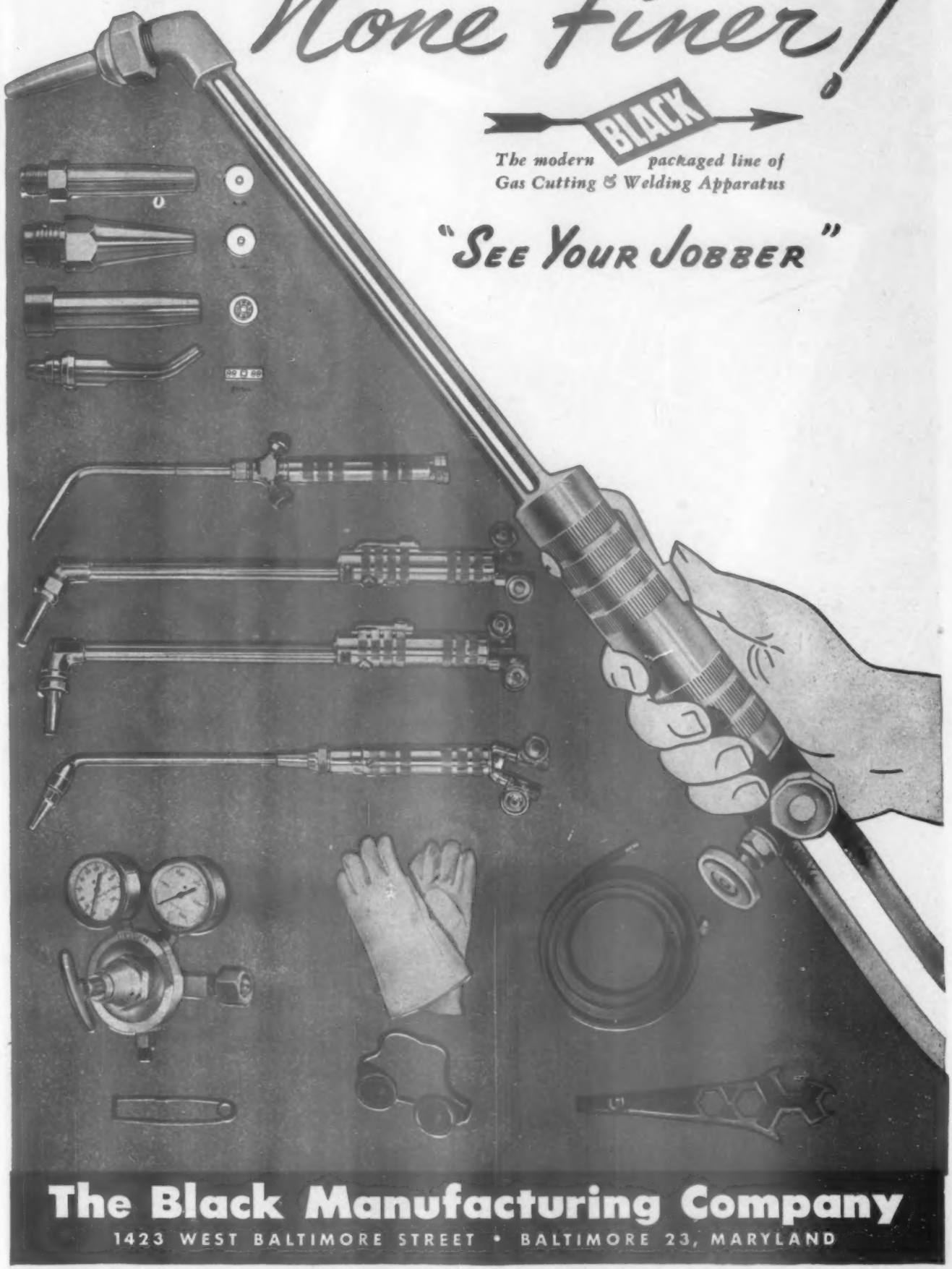

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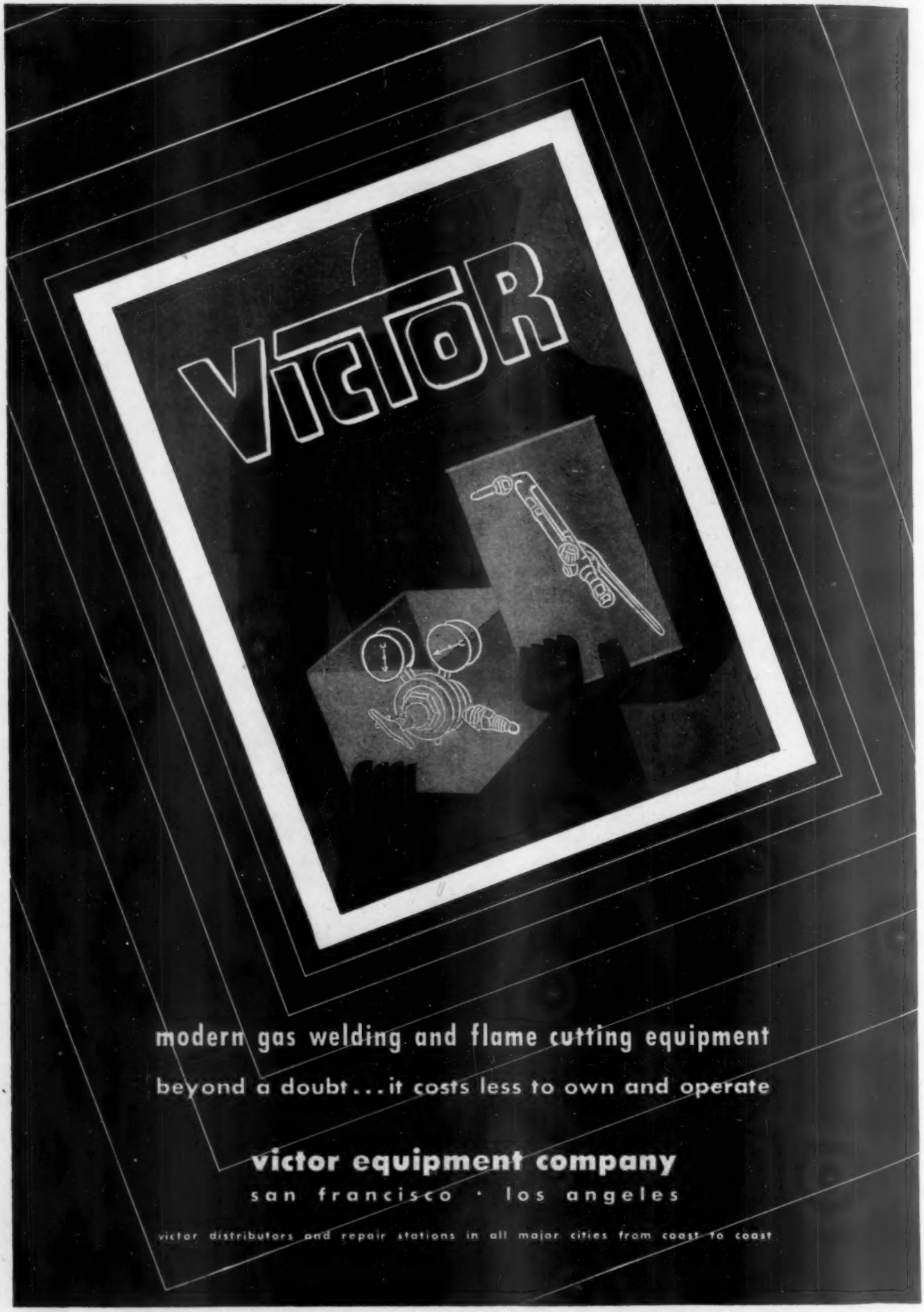
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ESTABLISHED 1916 — THE WELDING ENGINEER — DECEMBER, 1946

Prices, Profits and Production

FOR THE FIRST TIME IN FIVE YEARS America is returning to a free economy. From now on competition instead of controls will regulate the price of products, and manufacturers are free to price so that they may make a fair profit. The greedy ones who try for excessive profits will undoubtedly price themselves out of business, for the American public is in no mood to be gouged.

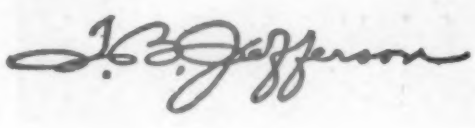
A free economy will undoubtedly work hardships—on those manufacturers who were once favored by the peculiar quirks of bureaucratic inflexibility. For instance, a newcomer was often able to get a ridiculous price for his goods, while OPA was refusing to allow a just profit to the oldtimers in the same field. Forced to sell at a loss or to cease manufacturing, the established manufacturers usually chose the latter, and hence the many shortages that have plagued us.

Now that wages are also free, let us hope that wage demands are tempered with justice and common sense. For there is a queer angle to this wage question: the more you get, the less you may have to spend. There is simply no point, for instance, in a 20% wage increase that is going to help force the cost of living up 30%. There is, however, one shining exception: wages increased on a basis of increased production are true gains. Such increases not only give the worker a larger purchasing power but result in more goods for others to buy.

We are well off in America as compared to other nations. Prior to the war, one out of every five persons owned an automobile as compared to one in 22 in France, one in 23 in England. Telephones show the same: one out of every five in America, one in 18 in England, 1 phone for every 30 people in France. The English worker has to labor five times as long as an American worker to buy a radio; the Frenchman 4½ times as long. Such are the benefits of a free economy.

Some misguided altruists argue that controls must be maintained to give workers "security." But security doesn't mean governmental coddling and paternalism. What it does mean is the chance to work continuously—steady employment—at real wages and not paper ones. Real wages are directly proportional to the wealth of the nation; the more goods we produce the more we will have to divide. Production will end forever the imaginary bugaboo of a runaway inflation.

Let the welding industry see that its own house is kept in order. The public has learned that welding processes offer the most satisfactory, strongest and least expensive means of joining metals. But if material and/or wage increases cause welding to become so costly that it is cheaper to use other joining methods, weldors and welding fabricators may find that they have worked themselves out of a job. Let's all take care that it doesn't happen.



NOW M & T OFFERS NI-ROD* for WELDING CAST IRON

Whether you want an electrode to repair worn or broken castings... to correct casting mishaps in the foundry...or even to make design changes—you'll find Ni-Rod the most satisfactory electrode in every respect for all types of welding work on cast iron.

For Ni-Rod deposits are strong, sound and fully machinable. They are also smooth, even, and close to the color of the casting. And since pre-heating of the casting to high temperatures is seldom necessary, warpage and distortion do not occur.

With Ni-Rod you can lay a smooth bead on any part of a casting—in any position. And the unusual flow characteristics of this electrode help eliminate variations in weld quality.

On your next job—see for yourself how Ni-Rod saves time, money, and does a better job on cast iron.

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Please send booklet telling how these electrodes can save time, money, and how I can get better welds on cast iron.

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HOBART Multi-Range gives you 1000 Combinations of WELDING HEAT

... all under perfect control

By being able to get the **exact** welding heat for every job, it's easy for you to produce high quality welds with less effort. Amount of costly rejects is sharply reduced, work is greatly speeded up. By a simple twist of the wrist any one of 1000 combinations of voltage and amperage is instantly available.

Another **exclusive** Hobart feature is the Remote Control Dial, which permits adjustment of welding heat at the work without returning to the machine. Saves countless steps, removes temptation to "get by" with improper arc adjustment. Allows location of welders on balconies when working space is limited.

Any Hobart Arc Welder you select (electric or gas engine drive) has the above feature as standard equipment – not an extra! Use the coupon below for further details.

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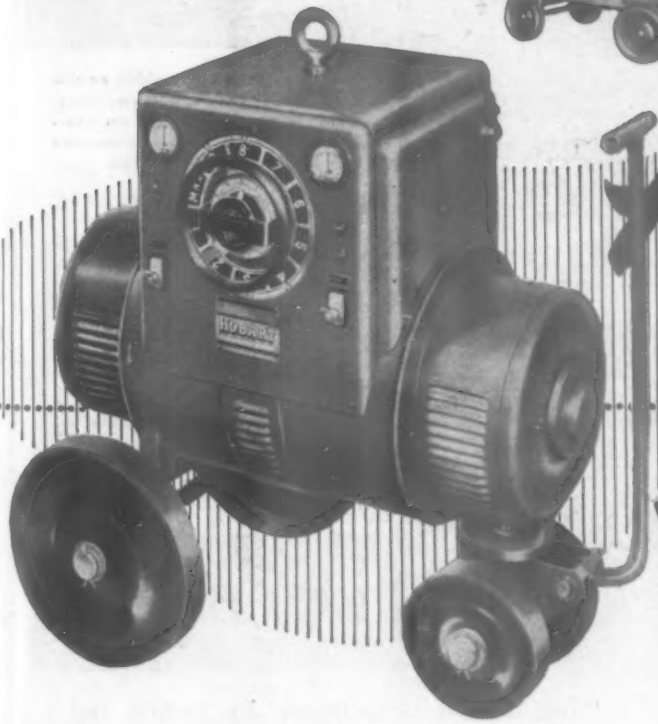

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New Tempering Attachment Gives

STRONGER WELDS IN AIR-HARDENABLE STEEL

●Fire-fighting ladders of low-alloy steel are now being spot-welded by a new method at the American-La France-Foamite Corporation, Elmira, N. Y. The welding machines are equipped with G-E synchronous electronic control and a new G-E tempering attachment.

HEAT TREATING ELIMINATES BRITTLENESS

To meet exacting strength requirements, these lightweight ladders must have tough, ductile welds. Such welds cannot be made in air-hardenable steel by normal methods because chilling effects of the water-cooled electrodes would cause the weld nugget to be brittle. And the weld, as a result, would be weak.

Use of the tempering attachment, by which the work is heat treated without removing it from the welding machine, makes possible consistently strong welds.

HOW IT'S DONE

The weld is made in the normal manner. When its temperature has dropped to approximately 200 to 300 degrees above room temperature, current is passed through again. Adjustment of this current, which differs in both time and magnitude from that used in the welding, is provided by the tempering attachment.

The additional heating, or tempering, materially increases the toughness and ductility of the weld.

FOR ADDITIONAL FACTS

Wherever medium-carbon, low-alloy, or high-alloy steels must be joined, spot welders with G-E tempering control will give a product of maximum strength. For further details about this control, get in touch with your resistance-welder manufacturer or our nearest office. Ask for our Bulletin GEA-4201. *Apparatus Dept., General Electric Company, Schenectady 5, N. Y.*

● ● ●

In this strength test, the American-La France-Foamite 100-foot, all-steel fire-fighting ladder supports weights totalling 3,200 pounds at an angle of 60 degrees.

Ladder sections are welded on this specially designed welding machine, which is suspended from an overhead monorail and moves the length of the ladder side rail.

● ● ●

RESISTANCE WELDING CONTROL

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When fabricating Stainless

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Hours spent welding it over again are an unnecessary cost which can be eliminated. Your decision to use Arcos electrodes for your stainless or alloy welding job is a long step toward eliminating non-productive man hours. When you order Arcos, you receive electrodes which, in the hands of a competent welder, deposit the sound weld metal you need. Sound welds—physically and chemically right for the job—the first time and every time, eliminate costly chipping and rewelding. Specify Arcos and avail yourself of the knowledge and a product born of fourteen years' experience in making stainless and special alloy electrodes.

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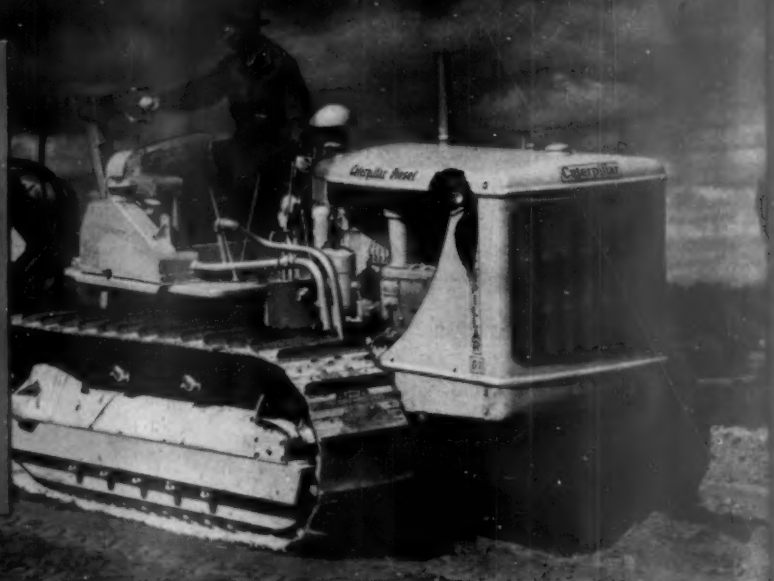
H. WOLTER and SONS, 14 North Loomis St., Chicago, manufacturers of metal goods for churches and religious institutions, know the practical value of A. O. Smith welding research. For all small work, no less than for the "big stuff," SMITHway Electrodes take the chance out of welding, make it the modern tool for *all* kinds of jobs and shops.

Welding church candlestick holders in H. Wolter and Sons shop

CATERPILLAR TRACTOR COMPANY, Peoria, Ill., one of the world's largest manufacturers of tractors for farm and industry, bulldozers, and other earth-moving machinery, employs SMITHway Electrodes for many production operations. Like manufacturers everywhere, "Caterpillar" knows the proof of SMITHway Electrodes is in production—and in *service.*



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